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Ron Austing/Cincinnati Zoo

A mulberry branch provides a tasty treat for "Mahatu," a Sumatran rhino living in the Cincinnati Zoo.

The Wildest Garden in Town

The garden is serene. Patches of yellow, cream, and rose pink water lilies ripple with the gentle water of the pond. A breeze rustles the leaves of the golden daylilies nearby. Suddenly an otter pops his head out from among the lily pads and looks quizzically at passersby. Another playful face breaks the surface of the water and glances around the shore before ducking under the water to resume her morning swim.

Otters in a botanical garden?

Well, not just any otter and not just any botanical garden. These Oriental small-clawed otters and their water lily-covered pond are both at home in the National Zoological Park in Washington, D.C.

In the past decade, zoos across the country have been adding more natural areas and landscaped settings for their animals. Zoos in San Diego, New York City, Chicago, Cincinnati, and Seattle have been foremost in creating state-of-the-art designs in zoological horticulture, but others are starting to include plants

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1990 Seed Program Catalog Enclosed!

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and garden designs in their master plans.

The First Zoos

The earliest zoos were menageries and animal shows where strange or exotic animals were caged and displayed as freaks of nature. The first American menagerie was organized in a small section of New York's Central Park in 1856.

Horticulture assumed a role only a few years later, according to Cincinnati Zoo horticulturist Dave Ehrlinger: in 1870 the Philadelphia Zoo became a zoological garden with plants incorporated into the public spaces and animal environments. Cincinnati followed suit a year later.

At first these zoos were groomed parklands rather than wild areas, Ehrlinger noted. Then in 1929, animal dealer Carl Hagenbeck of Hamburg, Germany, paved the way to today's greater naturalism by building the first cageless zoo. To create an illusion of wild animals roaming free, Hagenbeck substituted ditches, moats, and rock piles for metal bars.

The newest impetus to zoological horticulture is concern about the environment. Modern zoos are creating exhibits to increase awareness of the interdependence between plants and animals and the need for biological diversity.

Ric Hider, horticulturist with the National Zoo, defines zoo horticulture

as "horticulture with the complication of animals." Like most gardeners, zoo horticulturists do everything possible to create optimum conditions for the plants in their care. But giraffes licking the bark off maple trees and zebras digging up the lawn aren't problems for most gardeners. Such difficulties are commonplace at zoos, where horticulturists must make plants serve a number of functions while dealing with the animals' frequent lack of reverence for the landscaping.

"We're dealing with an animal in an enclosed space," says Hider. "We have to define what will survive in that space." Elephants will eat all the plant material within reach; a rhinoceros will bulldoze right through plant barriers such as shrubs and bushes.

But animals aren't the only threat to the plants, he said. "Our second concern is the public. In general, a zoo's clientele is much younger than the average botanical garden visitor—in May the zoo averages 200 buses of school children a day—and visitors are there to look at the animals, not to admire or respect the plant material."

But the effort is worth it, because zoo plants are much more than just attractive foliage and bright blooms.

Low-growing shrubs and vines may be used to create natural barriers or to disguise existing physical barriers between different animals or between the animals and the public.

Zoo Plants for People

Landscaping public areas is another important aspect of zoological horticulture. Lynden Miller—a public garden designer and winner of AHS's Landscape Design Award in 1989—was hired by the Central Park Zoo's architects to redesign the Central Garden around its seal pool. The project was funded by the Wallace Fund established by DeWitt and Lila Wallace, founders of *Reader's Digest*. Mrs. Wallace asked that the funds be used for a perennial bed.

A hedge of *Ilex crenata* 'Microphylla' separates the Central Garden from other zoo areas. Paths of hexagonal paving and teak benches were laid out to avoid the roots of the existing 50-year-old crab trees. Four beds contain 500 shrubs and 2,000 perennials, planted in large drifts to provide form and structure. Miller's favorite combinations include purple coneflower (*Echinacea purpurea* 'Bright Star') with gray Russian sage (*Perovskia atriplicifolia*) and *Coreopsis* 'Moon Beam' with *Stachys byzantina* 'Silver Carpet'.

Since the zoo has visitors throughout the year, the Central Garden is designed to be handsome in every season. Junipers, Colorado spruces, and weeping hemlocks along with oak-leaf hydrangeas, cut-leaf Japanese maples, and hybrid bluebeards (*Caryopteris x clandonensis*) add fall and winter interest. In summer, annuals like white *Nicotiana sylvestris* and purple-blue *Salvia farinacea* 'Victoria' and 'Indigo Spires' complement the perennial beds.

Although Miller didn't have to design the garden with consideration for the seals—animals don't have access to the Central Garden—she "thought it would be amusing to add plants with animal names since we were working in the zoo." Included in the menagerie are foxgloves, pink and white snapdragons, crab trees, and red-twig dogwoods.

And even though zoo-goers don't usually visit for the gardens, Miller notes proudly: "The public actually noticed—and really liked—the garden!"

Good plant habitats make the animals feel comfortable and secure. Plants may provide nesting areas, hiding places, or perches. In doing so, they both create attractive living areas for the animals and help educate the public about an animal's natural habitat.

Education is a key aspect of zoological horticulture. Zoos may keep vegetable gardens to teach the public about animal diets. The Central Park Zoo's bamboo plantings provide a special treat for their red panda while snow monkeys and colobus monkeys enjoy weeping willow branches. Grape leaves are a favorite among the primates. A zoo nursery may also provide browse— young twigs, leaves, and tender shoots—for animals to nibble on.

Picking the Plants

While it's unlikely that horticulturists will trek to the Amazon to bring back a 35-foot tree, they do try to acquire plants indigenous to an animal's natural habitat. Where native plants can't be used—due to climate considerations and/or unavailability—horticulturists may add a diversity of plants that complement the natural environment.

In the National Zoo's pygmy hippo enclosure, lush greenery has been chosen with an eye to softening the existing architecture. Massing, cascading, and upright species—fishtail and Boston ferns, philodendrons, rhapsis palms, *Thunbergia*, *Tetrastigma*, *Cissus*, dracaenas, weeping figs, and *Monstera*—are planted above the pygmy hippo pools. When the plants are mature they will camouflage their containers. Cascading *Epipremnums* will grow down to the pool level where the munching of the pygmy hippos will keep them neatly cropped.

The aviary at the Central Park Zoo recreates a rainforest environment. Large ficus trees and various ferns combine with bougainvilleas, passion vines, and *Aristolochia* to create a lush tropical atmosphere. Flowering vines provide a succession of blooms that are much enjoyed by nectar-feeding birds.

Chemical pest control is out of the question in these situations. The Central Park Zoo uses some biological controls; ladybugs keep down scale and mealy bugs in the aviary, where the birds also do their part. All exhibits there are as naturalistic as possible. "Plants that don't make it are left to die a natural death," says one of the zoo's horticulturists, Nancy Tim. "We may cut a palm frond back, but we usually just leave it unless it poses a threat to the animal. There is certainly no gardener pruning the Costa Rican jungle!"

The Woodland Park Zoo in Seattle has been a leader in naturalistic exhibitory

Their Association

Zoo horticulturists can receive expert advice from the Association of Zoological Horticulture. The non-profit association was started in 1980 to provide a network for sharing ideas and solving problems, and as a means of furthering horticultural research and conservation programs.

Members may exchange seeds and plant materials along with sources for hard-to-find specimens. The association holds an annual conference and publishes proceedings, papers, directories, and a quarterly newsletter.

The group is open to individuals, organizations, or companies who work in or are interested in the practice of horticulture in zoological parks and aquariums. Contact the Association of Zoological Horticulture, c/o Mark Fleming, Oklahoma City Zoo, 2101 N.E. 50th Street, Oklahoma City, OK 73111.

since mid-1970. One of the zoo's most recent horticultural projects, an Asian elephant exhibit, was a three-year endeavor by the Seattle design firm of Jones & Jones. A four-and-a-half-acre site covered with mature trees, including red alder, tulip poplar, red oak, and big-leaf maple, was chosen for the exhibit. Zoo staff added 700 more trees: tulip poplar, catalpa, Kentucky coffee tree, empress tree, paulownia, beech, ash, yellowwood, and striped bark



A red panda finds a home surrounded by pine, pygmy bamboo, and grasses at the Central Park Zoo.

maple along with 21 species of bamboo ranging from dwarf to timber. In all, the elephants' new home includes 12,000 trees of some 150 species.

A new wetlands exhibit at the National Zoo also incorporates naturalistic plantings. Giant and fragrant water lilies, water hyacinths, wild rice, and big-leaved arrowheads share the marsh with red-eared sliders, black-crowned night herons, and trumpeter swans. Exhibit signs identify wetland birds and turtles as well as plants in an effort to educate the public about whole environments.

The Arizona-Sonora Desert Museum in Tucson has created a living museum using the desert as background. On 17 acres within the Sonora's pristine 187 acres is a collection of zoological, botanical, and geological treasures. Visitors wander through saguaro cacti and other native desert plants to view exhibits that simulate desert habitats. Mark Dimmitt, curator of the museum's plant department, observes: "Animals are surrounded by native plants and geological formations here—visitors become immersed in the life of the desert."

Since zoo horticulture is a relatively new area, there are no handy reference books with tips for making both plants and animals happy. Horticulturists spend a lot of time seeking advice—from zoologists, keepers, naturalists, and fellow zoo horticulturists, but in the end, it usually comes down to trial and error. "Animals are individuals, just like people, with different likes and dislikes," Hider says. "The plants gorillas ignore at one zoo could be the same plants the gorillas pull up and play with at another zoo." A gorilla troop past bearing young are not as interested in the plant material around them, but young gorillas can play "holy hell with plants," he says.

Agrees Tim: "In some exhibits you are resigned to replacing the plants because you know they won't last very long. You just keep trying new combinations—our red-twig dogwood has survived quite well with the snow monkeys. I try to keep one step ahead of the animals. Most of the time I feel they're winning! But I feel very strongly that we're doing our bit toward the conservation of both animals and plants."

Sue Maloney, supervisor of grounds and facilities at Seattle's Woodland Park Zoo, says zoo horticulture is "hard work and a lot of stress, but it provides a wonderful opportunity to experiment, take chances, and try new barriers." At Woodland Park, she says, a combination of creative people and officials willing to try new ideas has made their horticultural endeavors a success. "We're lucky," says Maloney. "So far, everything has worked."

—Mary Beth Wiesner

Beware of Your Air

If your foliage has been speckled, your blossoms bleached, or your spinach shot with yellow, the explanation could be too little iron in the soil under your feet. On the other hand, it could also be too much ozone in the air over your head.

"Ozone damage is not something you hear a lot about," says Julia Kirtland of the Institute of Ecosystem Studies in Millbrook, New York, which for the last two seasons has featured educational displays relating to the pollutant's effect on plants.

Most people associate ozone with that occurring in the earth's stratosphere, the depletion of which is linked to the greenhouse effect and increased radiation exposure. But it is ozone building up lower in the earth's atmosphere that damages plants.

Even though many gardeners may be unaware of this threat, researchers have been looking into it since the late 1950s, said Robert Kohut of the Boyce Thompson Institute for Plant Research at Cornell University. "Scientists in Southern California realized that as the number of cars increased, they began to see strange lesions on plant foliage."

Ozone is formed when car exhaust and other hydrocarbons react with sunlight. While there are a number of air pollutants that damage plants, 90 percent of American crops killed by pollutants succumb to ozone and sulfur dioxide. And of the two, ozone is about 10 times more toxic, according to Edward H. Lee, a plant physiologist with the Agricultural Research Service of the U.S. Department of Agriculture.

Sensitivity Varies

Last summer, the Institute of Ecosystem Studies demonstrated the visible ravages of ozone with a display in which two varieties of the same plant were grown side by side, one unprotected and one in an ozone-free chamber. The previous summer, Millbrook staff had put together an exhibit that showed the differences in ozone-sensitivity of various fruit and vegetable cultivars.

Some plants are so sensitive to ozone that they are used as "indicator plants": damage on tobacco plants, milkweed, blackberry, black cherry, sweetgum, and tulip poplar means that damage to other plants in a given area



Photos Courtesy Boyce Thompson Institute



Two leaves damaged by ozone. The sassafras leaf, left, shows stipple, an accumulation of black to purple pigment. The green ash, right, shows fleck, where areas of tissue have been killed. Fleck is yellow to light tan. Both are visible only on the leaf's upper surface, and may coalesce to cover larger areas.

can possibly also be chalked up to ozone. Among other very sensitive plants, showing damage after a couple of hours exposure at an ozone concentration of .1 parts per million, are spinach, muskmelons, oats, pinto beans, white pine, potatoes, and tomatoes. Somewhat more tolerant, showing some damage after one to two hours exposure at .2 parts per million, are begonias, onions, chrysanthemums, dogwood, sweet corn, wheat, and lima beans. Those able to tolerate exposure as high as .35 parts per million for an hour or two are zinnias, radishes, poinsettias, black walnuts, strawberries, and carrots. But there is also variation among cultivars of these groups.

Unfortunately, Kohut said, there has been little systematic research aimed at breeding ozone-resistant plants. "If a plant is bred in a high-ozone locale, that may incidentally screen out ozone-sensitive plants," he said. "We may see that it's resistant to pathogens, but we don't understand the link."

Ozone does its dirty work by destroying the chloroplasts that make chlorophyll, which plants need to make food. But it can also wreak invisible havoc, weakening cell walls so that vital nutrients leach out, or causing the plant to age rapidly. The stress it creates raises the sugar content of leaves so that they are more appealing to insect pests, says Lee.

Kohut says visible damage occurs on three levels. At low-level exposure, the upper level of the leaf looks stippled, while there is no apparent change on the undersurface. At the second level, larger flecks indicate the death of tissue; small lesions begin to coalesce. The third stage is what he called "serious bifacial necrosis." Damage can

be seen on both sides of the leaf, and foliage ages rapidly so that fall colors appear prematurely.

Pockets of Pollution

The most widespread concentrations of ozone occur in urban and industrial areas: the Northeast, Southeast, upper Midwest, Southern California. But ozone can easily travel to more rural areas, as is the case in Millbrook, which is 80 miles north of Manhattan. And there are also odd little pockets of pollution throughout the country. For instance, Kohut said ozone is high in mountainous areas such as Denver, Salt Lake City, and portions of the Adirondacks, where air masses can't circulate freely.

The Agricultural Research Service wants to nip ozone before it gets to the bud: they estimate that cutting ozone by 25 percent would save farmers well over a billion dollars a year. They have found that drenching plants with a growth regulator, ethylenediurea, seems to protect them against acute ozone exposure, but they're still not sure that the treatment will be effective in the field.

Since agricultural research results usually have to trickle down to home gardeners, they will have to glean much of their own information about ozone damage to ornamentals and many edibles through trial and error. If you know or suspect that you live in a high-pollution area, you may want to add ozone-resistance to the list of virtues for which you evaluate your plants next season.

Foliage as Filters

Chrysanthemums and space exploration may not seem to have much in common. But studies by the National Aeronautics and Space Administration (NASA) show that mums and other plants can remove up to 80 percent of several harmful gases commonly found in modern buildings.

In response to the study, the Associated Landscape Contractors of America has

founded the Foliage for Clean Air Council (FCAC). The NASA studies were conducted under laboratory conditions as the agency sought ways to keep air clean for long periods in the closed conditions faced by astronauts. The FCAC plans to conduct follow-up studies in real office buildings.

Among the pollutants being inhaled by office workers are formaldehyde and

benzene fumes released from building materials, furniture, and carpeting; ozone released from photocopy machines; radon; secondhand smoke; and fumes from cleaning solvents.

We're not safe at home, either. According to the U.S. National Research Council, a typical energy efficient house—with one complete air change every five hours—contains 240 micrograms of formaldehyde per cubic meter; 1,150 micrograms per cubic meter are released every 24 hours.

One of the most efficient plants for removing formaldehyde from the air is mother-in-law's tongue (*Sansevieria trifasciata*). An average size plant can remove about 30,000 micrograms of formaldehyde per 24 hours. Two plants would adequately cleanse the air in a room 10 feet by 15 feet by 8 feet (about 34 cubic meters). Several pots of *Philodendrons*, golden pothos, or spider plants (*Chlorophytum comosum*) would remove the same amounts of formaldehyde.

Other efficient air-filtering plants include *Spathiphyllum*, *Dracaena deremensis* 'Warneckii', *Dracaena marginata*, chrysanthemum, and, should you choose to bring it indoors, the gerbera daisy.

Look! Up in the Stratosphere!

As if worrying about the ozone in the atmosphere weren't enough, a U.S. Department of Agriculture scientist says that depletion of stratospheric ozone is also posing a hazard to plant life.

Dr. Autar Mattoo, research leader at the Plant Molecular Laboratory of the USDA's Agricultural Research Service in Beltsville, Maryland, says that ultraviolet radiation from the sun that is normally filtered out by high-level ozone can rapidly degrade a plant protein called 32kDa that is vital in photosynthesis.

As the protein is broken down, plants produce more to maintain the balance they need for photosynthesis, but they have less energy for growth, Mattoo says. So far, this effect has been

observed in artificial laboratory conditions in which duckweed, an aquatic plant, was exposed to different wavelengths of light. Those in the ultraviolet range caused the most damage to the protein.

Some plants are resistant to ultraviolet damage, Mattoo noted. If researchers can learn how such plants protect themselves, they may be able to use those traits to protect more vulnerable plants.

Stratospheric ozone is thought to be thinning due to the use of chlorofluorocarbons, which have been widely used as refrigerants, aerosol propellants, and solvents, but are increasingly being regulated or outlawed.

The Methane Menace

We may be contributing to the greenhouse effect every time we add fertilizer to the soil, according to a Massachusetts study.

Although the major blame for global warming is laid to carbon dioxide, up to 20 percent of the phenomenon may be caused by methane, a gas produced by sources that range from bogs and marshes to the intestines of cows. Much of this methane never reaches the atmosphere because it is consumed by soil microorganisms. But these microbes prefer to dine on nitrogen when it's available. Industry is feeding them more nitrogen through acid rain; gardeners and farmers are dishing it out in fertilizers. Atmospheric methane has approximately doubled in the past two centuries.

When four scientists—Paul Steudler, R. D. Bowden, and J. M. Melillo of the Marine Biological Laboratory at Woods Hole, Massachusetts, and J. D. Aber of the University of New Hampshire—applied ammonium nitrate to stands of trees in Harvard Forest, they found that methane consumption in the most highly fertilized plots dropped by 33 percent over plots left unfertilized.

The researchers attached a lot of caveats to their findings: it's hard to say what the six-month study might indicate in global terms, and the amount of fertilizer used was more than twice as heavy as a forester might use on a stand of trees. "I don't think the amount used

by the average gardener would have a measurable effect," said Bowden.

The findings don't imply that you should switch from chemical to organic fertilizers, he noted. "It doesn't matter how the nitrogen gets there. If there is too much of it, it will alter the microdynamics of the soil."

Don't Blame Bossy

Methane may contribute to the greenhouse effect, but cattle aren't contributing much of that methane, says an animal scientist with the Texas Agricultural Experiment Station.

Some environmentalists have claimed that gas from the digestive tracts of cows and other ruminants produce as much as 15 percent of the world's atmospheric methane gas. Thus we can protect our globe by eating less beef, they argue.

But Dr. Floyd Byers claims that U.S. beef cattle produce less than one percent of the total methane gas that reaches the atmosphere each year. The fossil fuel used to drive a vehicle six miles each way to buy a quarter-pound hamburger for lunch has five times as much potential impact on global warming, through the carbon dioxide it produces, as does the hamburger itself, through the methane it produced when it was still on the hoof, Byers estimates.

Ironically, reduced beef consumption may lead to other environmental problems. People are forsaking beef for seafood, and a Vermont newspaper, the *White River Valley Herald*, recently reported that every species of fish being used for food is already being fished at or above its capacity to replace itself.

Members' Forum

Dangerous Advice

I must write to warn you of the very dangerous advice about electric fence construction given in the September "Gardener's Q&A" section!

I quote: "The electricity can be supplied by a solar collector (backed up by a battery), an electrical socket, or by a battery alone." No mention is made of the absolute necessity of using an electric fence charger to modify regular 110-volt household current delivered by an electrical socket. The unmodified 110-volt current can be fatal.

L. G. McKeever
Orinda, California

One should NOT attempt to build a deer fence without a charger. Although electricity can be supplied by a 110-volt AC household current, a fence charger (or energizer) must be used to regulate the electricity. Chargers increase the voltage but decrease the duration of the charge to mere thousandths of a second, so that a person or animal coming in contact with it receives a shock sensation but is not "frozen" to the wire and possibly electrocuted. These are often included in the wiring kits, but they can be purchased at agricultural co-op stores or hardware stores.

Plea for *Pleiones*

While I agree with your September article urging gardeners to avoid wild-collected bulbs, I do not feel that the *Pleione* should be included under a blanket condemnation. I have grown *Pleiones* for about 10 years and can assure you that none are wild-collected. My original stock was obtained as excess from the arboretum at the University of California at Berkeley.

Most of the choice plants of *Pleiones* are named cultivars that can only be produced by clonal propagation. There is a continuing program of hybridization in England; new cultivars are also being offered in New Zealand.

We are indebted for much of this work to Philip Cribb and Ian Butterfield, who recently wrote a monograph, *Genus Pleione*, available from Timber Press in Portland. They did collect *Pleiones* in the wild in China some years ago, and have introduced several previously unavailable species. Like any respectable plant hunters, I feel sure that they exercised due



Pleione 'Oriental Splendor'

caution in their collections. Without collections of this nature, our gardens would be barren indeed.

In other respects, *Pleiones* seem to be outcasts of the orchid world. Growers of the common warm-climate orchids look on them with disdain. I have yet to find a source in the United States and I have been in contact with more than 100 growers. I find this most disappointing as *Pleiones* seem well-adapted to Zone 7 and milder gardens and do well as house plants. Along with several friends, I am currently engaged in efforts to import some of the new cultivars from England. Many of these are extremely colorful and should be grand additions to our gardens once stocks have been built up.

I have been retailing *Pleiones* in the Northwest for the last five years. They are very popular at garden club plant sales and increasingly so with garden centers. Given the right situation, they are very showy in the spring and increase fairly rapidly. I have found them hardy to at least 8° F in my yard. I currently grow three cultivars and three species. I would very much like to hear from other growers.

Richard Cavender
15920 S.W. Oberst Lane
Sherwood, Oregon 97140

Faith Campbell of the National Resources Defense Council said that at the October meeting of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), wild collecting of Pleiones was found to be a continuing problem. "As recently as 1985, Japan imported at least 250,000 million Pleiones from Taiwan," she said. Although Japan has begun to propagate some other

terrestrial orchids that were once wild-collected, it is believed they are still trading in collected Pleiones. But she added: "We are sure that there are people out there who are propagating them. I would encourage those growers to put the word 'propagated' on their labels."

Seed Suggestions

The Society could secure a better response to their Seed Program if they made a request in each News Edition. Many members are able to collect seeds almost every month of the year. In my own garden and greenhouses, many plants are either just beginning to flower or emerging from summer dormancy with flowering in late December or early January. If the Society can accept seed at any time, it would keep members interested in collecting seed, and save labor required at your end to prepare the list.

You should also indicate more clearly what is or is not desired. I have been told that spores are acceptable, but that "noxious weeds" and endangered species are not.

What is a noxious weed? I have spent several years trying to eradicate *Oenothera hookeri* that I deliberately planted. That to me is a noxious weed, but perhaps to you a prized plant. And I strongly believe that endangered species should be sought, *provided* they are not collected in the wild. All horticultural societies should encourage such donations. That is the only way we have a chance of saving our rapidly diminishing flora.

What is the minimum amount of seed acceptable? I was told it was not worth offering seed if 250 to 500 packets of a plant were not available. Assuming that many might donate identical seeds that could be combined into one lot is absurd; earlier this year I sent *Annona cherimola* and *Massonia pustulata* (large form) seeds and seriously doubt if anyone else has.

Finally, why not an article on how to prepare seeds? Not all seeds just "pop out" to be collected. I have given up trying to secure large quantities of *Leycesteria*, *Opuntia*, and *Zantedeschia* species. Even *Acanthostachys* has created a challenge. If you offered procedures for cleaning these and similar seeds, then perhaps the selection would be increased.

Leonard H. Corbett-Grant
Napa, California

Yes, we probably should remind members more frequently of this special benefit. We do accept seed any time of year; if it misses the Seed Program deadline, it will be distributed during the next year's program.

We are well aware that one gardener's weed is another's treasure; what self-sows obnoxiously in one location may sprout grudgingly in another. We try to avoid accepting seed of plants that create an environmental hazard, such as the *Lythrum salicaria* that somehow sprouted in our 1989 catalog and was then withdrawn from the program.

We can not accept seed of endangered plants from private individuals, but will accept seed of such plants from botanical gardens and nurseries known to propagate these plants on their premises.

We do accept and distribute small amounts of seed. However, we usually do not list this seed in our catalog. It's frustrating for us and our members to get many requests for seed that was gone the first weeks of the program; not surprisingly, the rarer it is, the more our members want it. If it would make less than 50 packets, we either keep it until the next year in hopes that we will get more, or distribute it as a "thank you" to members who make a large contribution with their seed request.

We hope that members enjoyed Elisabeth Sheldon's article on collecting seed in our October magazine. As it points out, seed differs greatly in how and when it can be collected. If you would like more detailed information on obtaining specific types of seed, our Gardener's Information Service may be able to help, or you might want to ask for ideas from other members through Members' Forum.

Vinegar and pH (cont.)

I found a very confused discussion of pH in the November issue. To clarify: pH is the negative logarithm of the concentration of hydrogen ions. For any increase in the concentration of hydrogen ions, one would see a decrease in the pH. While it's true that water can dissociate to furnish positive hydrogen ions, for every hydrogen ion produced there would also be a negative OH ion that would quickly react with one of the excess hydrogen ions to form water. So any contribution of hydrogen ions by water added to vinegar would be short-lived.

What adding the water actually does is reduce the concentration of hydrogen ions by dilution, thereby increasing the pH, analogous to what you do when making a fertilizer solution.

Charles W. Everson
Shepherdsville, Kentucky

You are right. We were wrong. The result you get by mixing vinegar and water involves dilution, not a chemical reaction. Our explanation to a reader who was afraid that municipal water was too alkaline for his bonsai, and wanted to know if it was safe to address the problem by watering them with a vinegar solution, became particularly confusing because mixing and using the solution raises the vinegar's pH, lowers the water's pH, and lowers the soil's pH. Apparently, we had some readers going up and down. Thanks to Elisabeth Belfer of New York City and Nickolas Nickou of Branford, Connecticut, for also pointing out that vinegar is "acetic" acid. As Dr. Nickou observed, the common name for "acetic" acid would probably have to be "reclusive acid."

The next reader gives us reason to believe it wasn't pH we should have been discussing in the first place:

William Wylie Jr.'s November letter about using vinegar to lower irrigation water pH noted that "the subject of pH is seldom mentioned, much less emphasized, in the literature." Gardening literature tends to avoid any in-depth discussion of horticultural chemistry.

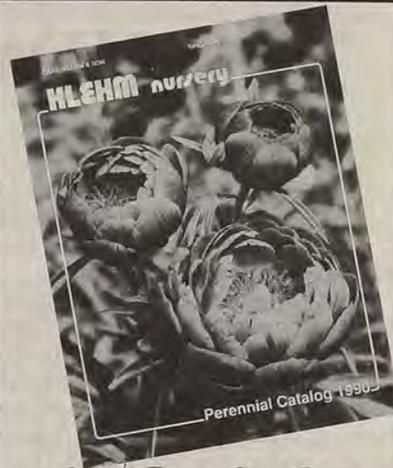
Actually, irrigation water pH by itself is not the best indicator of whether water will cause the soil pH to increase. Two water supplies, both with pH above 7, may have different alkalinities. Alkalinity is measured by adding acid to a water sample until the pH drops to 4.5; the result is reported in units of milligrams of calcium carbonate per liter.

Container soil pH often rises when the water alkalinity is high. The pH increase is caused by the bicarbonate in the water. Commercial container plant growers often add concentrated phosphoric, nitric, or sulfuric acid to lower the alkalinity to about 100 mg. per liter. Home gardeners who use municipal water might be able to find out its alkalinity from their water treatment plant.

David R. Hershey
University of Maryland

Correction

In transcribing directions for building a misting chamber for cuttings in our November issue, we misread 4' as 4": the plant lights required for the chamber need to be four feet long. Thanks to an alert reader at the University of Illinois for catching the error, and we apologize to any readers who may have been fruitlessly searching for pygmy plant lights.



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New EPA Rules Could Hit Home

Until now, home gardeners have not been affected by federal rules intended to protect endangered plants and animals from pesticides.

But new regulations being proposed by the Endangered Species Protection Program of the U.S. Environmental Protection Agency (EPA) are expected to set limits on at least a few outdoor home and garden pesticides, depending on where they are being used. How gardeners will be informed of these rules, and how they will be policed, is still unclear.

Originally, the EPA exempted home pesticide users from its regulations under the assumption that such products—used in limited amounts in areas generally devoid of wildlife—would have no impact on endangered species. But now, in response to public pressure from environmentalists, the agency is developing a new program geared toward protecting each endangered species and its habitat from any pesticide threat. At the same time, the nursery



LaVerne Smith



J. P. Mattson

The Chapman rhododendron and the piping plover are among the endangered species that will be protected by the new EPA ruling.

trade is monitoring the proposed program in an effort to protect their interests and ensure reasonable implementation of the plan.

The impact on home use should be minimal, according to the EPA, and not all home gardeners will be affected—only those who live in areas where use of a chemical has been found to harm endangered species or where the Fish and Wildlife Service (FWS) has

provided specific measures to reduce incidental exposure. FWS is the major federal agency responsible for administering the amended Endangered Species Act of 1973 for most species. This act provides protection for animal and plant species that are threatened or in danger of becoming extinct and conserves the ecosystems they depend upon.

Four Steps

The new program will involve four steps:

1. The EPA will gather information on endangered species, focusing first on those with the most immediate need for protection. Then it will determine which pesticides their habitats may be exposed to.
 2. It will determine whether pesticides being used in those areas "may affect" the species.
 3. If the highest application rate shown on the pesticide label poses a problem, the EPA will determine the lowest level that may affect the species and request a consultation with the Fish and Wildlife Service. FWS will respond with a biological opinion indicating whether or not the species is in jeopardy from the pesticide use. Not all pesticides that EPA determines "may affect" a listed species will necessarily jeopardize them.
 4. If the species is in jeopardy, the agencies will develop habitat maps and descriptions and issue bulletins for affected counties showing the geographic areas of concern. The bulletins will be updated annually.
- Public participation will be encouraged during key steps of this process. Pesticide users may submit any data or information they find relevant, and request amendments to pesticide restrictions. EPA officials say

Label Them Careless

A recent University of California study shows that pesticides used in and around the home don't command a great deal of respect. When UC-Davis researchers James Grieshop and Martha Stiles surveyed 415 home pesticide users in the Sacramento area, one out of four said they had suffered illness after exposure to pesticides. Yet two out of five don't read the product labels, fewer than half wear protective clothing when applying pesticides, and one in five sometimes apply stronger-than-recommended dosages.

This casual attitude toward pesticide hazards has serious health implications. Pesticide poisonings rank third among all non-drug poisonings at the UC Medical Center in Sacramento. A 1987 study by the National Cancer Institute revealed that children living in households where home and garden pesticides are used are up to six times more likely to develop some form of childhood leukemia.

Experience is not a good teacher in this case. Veteran pesticide users, perceiving the chemicals to be safe, were the most likely to take fewer precautions. And even though some individuals respected the pesticides enough to wear protective clothing when applying them, they were the most likely to mix doses that exceeded the label instructions.

Nurseries and garden centers are the primary sources of information for pesticide use, followed by pesticide packages and labels. But labels are the only readily available sources of information after purchase.

The researchers think product labels could do more to underscore pesticide risks. "Labels appear not to be sufficiently strong in their warnings and recommendations," says Grieshop. "Typically, labels warn or caution users to avoid chemical contact to the eyes, skin, and clothing and to avoid breathing the substance, but they seldom include explicit ways to avoid exposure, such as wearing gloves, long sleeves, goggles, masks and washing up after use."

Labels also fail to give adequate or appropriate disposal information. Disposing pesticide containers in the household garbage is prohibited by California law, but most labels instruct users simply to "dispose of properly" or to dump the unused portion and throw the container in the trash.

Better labeling may help but it's not likely to solve the pesticide safety problem: 38 percent of the individuals surveyed never read the labels at all.

they are looking for reasonable changes that will protect wildlife while minimizing limitations on pesticide use: for instance, changes in application methods or timing of application could significantly reduce exposure levels in many cases.

According to EPA statistics, five to 10 percent of American pesticide use occurs in the home or garden. Seventy to 80 percent of that involves indoor pesticides, which are not affected by the current proposal. However, a surprising amount of poison is concentrated in and around the average home: the May/June issue of *Harrowsmith* magazine estimates that suburban homeowners use more pesticides per acre than farmers use on their fields.

Label Changes

In cases where changes in pesticide use are found necessary, manufacturers will have to revise labels to instruct users to follow information in county bulletins. However, labels on affected products will not list the counties in which limitations on pesticide use apply. It will be up to the individual user to obtain the county bulletin and comply with the use limitations if there are any. If not, the bulletin will tell users to follow label directions and will provide general information about endangered species. Current EPA data indicates that restrictions could affect 900 of the nation's 4,300 counties.

Bulletins may be distributed through training and certification programs within the states and the County Agricultural Extension Service. Other suggested outlets include pesticide dealers and distributors, Soil Conservation Service field offices, Fish and Wildlife Service field offices, EPA offices, and the offices of state regulatory agencies.

The proposed generic label statement and bulletins may not be the most effective communication tool, the EPA admits. Alternatives will be explored during pilot programs in several states.

Some states already have similar, or even stricter, programs, and at least 17 have indicated they may start pilot programs this year to evaluate whether the federal program is feasible and to find the best way of distributing information and gaining cooperation. States may suggest innovative ways of reducing the burden on pesticide users.

The new regulations should be in place by January 1991. But the EPA will continue to look at new biological opinions, new pesticides or new uses for old ones, and to assess the economic impact of the program on users such as nurserymen and farmers.

Making a Difference

Samaritan from Hamden

Bill Liddell didn't set out to be a philanthropist, he insists. He just had a lot of extra vegetables to get rid of—so far, about 50 tons worth—all of which he has given to Connecticut's homeless and hungry over the past five seasons.

Liddell, who lives in Hamden, Connecticut, was a longtime employee of Associated Seed Growers of New Haven. Now owned by Upjohn, it is described by Liddell as the biggest vegetable seed company in the world for commercial growers, and he was its "word man," working in advertising, public relations, and as a field representative.

He had gardened as a hobby ever since he was a student at Yale. "I liked to see what I was writing about, and it was cheaper than golf or owning a boat," he explains. His three-quarters of an acre always yielded enough to can, pickle, and freeze a healthy quantity. Then five years ago he retired, "and at one point I realized I had more than I needed." Like other people with something to get rid of, it occurred to him to donate the excess to the poor. But his gift was far more valuable than worn out shoes.

Soup kitchens get their name from the fact that they rarely have fresh produce available. Hence they serve bread, canned goods, and soups. "Most of what the food banks get is distressed merchandise from wholesalers, or stuff that's been culled over or trimmed off by produce buyers who can write it off for a tax advantage. There is a crying need for fresh vegetables for these people," Liddell says. The first year he gave the Connecticut Food Bank 7,000 pounds of produce. Each year he's increased that; in 1988 it was 28,000 pounds. He didn't have the 1989 total by the January News Edition deadline: his methods let him grow from February well into December.

Liddell practices intensive gardening: planting rows of beans between his tomatoes; starting most crops in cold frames or on tables under shop lights in his basement to give them a headstart; getting three different crops out of some areas each season. As soon as the mustard is worn out in mid-June, in go the beans; when they're gone in mid-August it's time for broccoli, collards, and kale. He uses biological warfare against pests as long as it works, but

isn't averse to a pinch of diazinon to discourage the cabbage maggots. "Gardening without chemicals is like riding a unicycle," he's fond of saying. "It's a neat trick if you can do it, but it's a hell of a way to get to New York City."

He grows most every vegetable except potatoes, onions, and carrots; "I'm not efficient enough for those," he says. He recruited volunteers from two local churches to help him with garden maintenance, and they now grow all of the peppers and cucumbers for the project.

Workers at the soup kitchens that benefit from Liddell's largesse emphasize that it's the quantity of his produce that makes it so valuable: a tomato or two doesn't go far when there are hundreds of mouths to feed. Liddell advises those who would like to follow in his footsteps—and he hopes there will be many—to contact area agencies first to see what their needs are. It's important to know if the food bank has facilities to store vegetables that spoil quickly. You don't want to be a burden to the very people you want to help, he noted.

Chicago's Helping Hands

Ten Chicago area soup kitchens are beneficiaries of a partnership between Allstate Insurance employees and the Chicago Botanic Garden. Cliff Zenor, coordinator of the botanic garden's Gardening Resources on Wheels program, advised the 120 employees about what to grow, designed the 150 by 50 foot garden on Allstate grounds, and offers suggestions on pest control. The soil is adjacent to a freeway, so Zenor tests the soil once a year for lead, according to the Chicago Horticultural Society's *Garden Talk*.

The employees broke the ground; improved the soil; built a fence, underground irrigation system and tool shed; and bought and planted all the seeds and seedlings. One hundred percent of their tomatoes, green peppers, green beans, onions, potatoes, squash, zucchini, carrots, and beets goes to charity.

We would like to make this column a regular feature! Tell us about people you know who are using horticulture to "make a difference."

Regional Notes

Charleston Gardens' Trees Toppled by Hugo

Southern California botanical gardens were barely touched by the October 17 earthquake, but several in and around Charleston, South Carolina, were battered by Hurricane Hugo a month earlier.

Charleston's Cypress Gardens was damaged so severely that it will probably be closed all next season, said manager Cathy Townsend.

Trees over half of the 172-acre garden, which includes camellias, azaleas, and dogwoods in addition to its huge cypresses, were knocked down or mortally wounded. The main building, a romantic pink stucco structure built around 1930 by a wine merchant who owned the property, was completely destroyed.

Silver Lining

Townsend said there is a silver lining to the disaster: the staff had wanted to remove some trees so their azaleas would receive more sun, but they feared that felling the trees would damage the shrubs. Hugo had no such qualms. "Most of the azaleas should come back from their roots once we get the trees off of them, and we should get better bloom," she said.

Of 79 trees in the garden's picnic area, only four remain. "And no one likes to picnic in the sun in a Charleston summer," observed Townsend. "Our main area will look very different. We'll have a lot more land to plant, and maybe we'll put in roses and other things we haven't been able to grow before."

Ninety-five percent of the pines in the surrounding forest were lost, but clean-up was hindered by the garden's location far from a main road.

Townsend said they were considering the solution used by nearby Magnolia Plantation and Gardens, which hired a helicopter to remove larger trees.

The Magnolia garden, hit by winds up to 130 miles per hour, fared somewhat better and was able to reopen by mid-October. It lost 70 percent of its pines, but only five percent of the live oaks so prevalent in the area. Species such as cypresses and tupeloes growing in the standing water of the garden's new Audubon Swamp Garden seemed impervious to uprooting, officials said.

Ross Randall of Charleston's Middleton Place, which contains the oldest landscaped gardens in the country,



A helicopter removes trees from a South Carolina forest.

Gary A. Cameron/Washington Post

said in late October that two-thirds of their gardens had reopened, but that the rest of the 70 acres were still being cleared of debris. The garden's most popular attractions—its camellias, giant oak, lake, and butterfly statue—were all unscathed, said Randall.

Tree experts from Colonial Williamsburg helped them stabilize and save some live oaks that were damaged, and many other volunteers have helped with clean-up. Randall said a fund-drive has been started to help with the restoration, and that more volunteers with botanical expertise will be needed after clean-up is complete.

At Brookgreen Gardens in Murrells Inlet, known for its outdoor sculpture, the artworks were undamaged, but the limbs of live oaks were broken and many smaller trees and shrubs were uprooted. Many of the latter were cut back and replanted and have a good chance for survival, said director Gurdon L. Tarbox Jr.

Tarbox said several maintenance and support facilities were destroyed but no public buildings were seriously damaged and the gardens were able to reopen one week after the storm. Damage to the surrounding forest area was still being assessed.

An estimated 36 percent of the state's forest area, or about four million acres, was severely damaged. It was a blow both to natural areas, such as the Francis Marion National Forest, and to the forestry business, the state's third-largest industry. Nurserymen were hurt, too, by power outages, damage to structures, uprooting of field-grown plants, and loss of large trees that shaded tender plants.

Escape from the Quake

In California, even the botanical garden closest to the epicenter of the October earthquake escaped damage. "We're on good, solid turf," said Brett Hall, manager of the Arboretum of the University of California at Santa Cruz. "We had a few tools thrown around and a few plants were knocked off the shelves. That was about it." Officials at Strybing Arboretum in Golden Gate Park and the University of California Botanical Garden at Berkeley reported only minor damage that did not involve plants or important structures.



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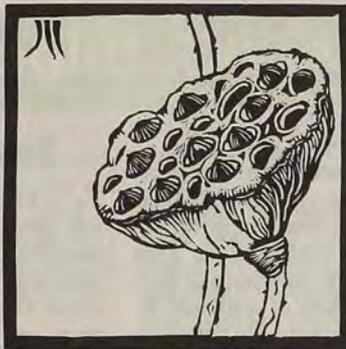
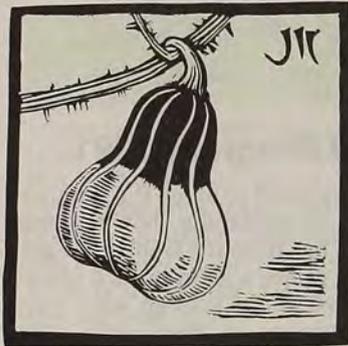
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Seed Program

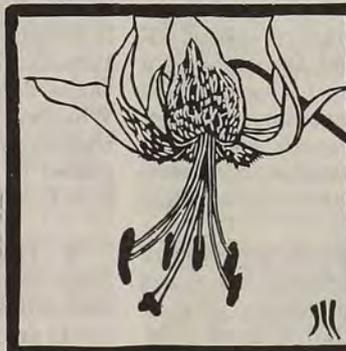
C a t a l o g

If the AHS Seed Catalog arrives, can spring be far behind?

Pity the poor gardeners who haven't yet discovered the wonderful world of seed: too difficult, takes up too much room, they protest. They dream the winter away, their fingernails pitifully free of soil, waiting for the ground to warm and their perennials to arrive in the mail. Come April or so, they'll go deeply into debt at their local nursery.

No such fate for participants in our Seed Program. Clean up those flats! Invest in a new heating cable! Check the vermiculite supply! You can have seedlings to pamper in a few weeks. We have easy seed and exotic seed. You can fill a greenhouse with cacti or start an herb garden on your kitchen windowsill. Astound the neighbors with a bountiful vegetable garden, or cool your apartment house rooftop with trees and vines.

But whatever you do, make your selections today. Horticultural hope may spring eternal, but he or she who hesitates is lost; some of our most popular selections disappear the first week. Don't just sit there lost in reverie while fellow AHSers get the jump on you.



How to Use This Catalog

How to order

Although we have a small mountain of many of the species listed here, in some cases the donors—other members, seed companies, and botanical gardens—were able to provide only a small quantity. To increase the chances that you'll get the seed your heart desires, fill out your order form and mail it now. Whenever possible, we will send you your first-choice selections. But we ask that you list alternate selections that we can send in case any of your first choices are depleted. Our staff and volunteers who fill your order will not choose substitutions for you; only you know what is best for your own garden.

Once you've decided what you want to order, fill out the order form on page 12.

After sending us your order, it is important that you keep this catalog: you will need it to identify the seed you receive. All the seed packets distributed through the Society's annual Seed Program are marked with only the master list numbers that appear in the catalog.

There is no cut-off date for orders this year. But the longer you delay in placing your order, the less likely it is that you will receive all your first choices and have them up, ready

to adorn your landscape by spring.

As you complete the order form, we hope you will consider making a donation to help defray the cost of the Seed Program by including a voluntary contribution. This year, we are suggesting a minimum of \$2 if you are ordering 10 packets of seed, and \$3 if you are ordering 15 packets. By donating even more, you can help AHS expand and improve its Seed Program. All contributions to the American Horticultural Society are tax-deductible.

Supplementary list

Seed received too late to include in the catalog, but which we nevertheless want to make available to members, has been listed in a supplementary seed list that is available upon request. The supplementary list also includes seed we have in very limited quantities, so that we may be able to fill only a few requests. Growing plants from seed is always an adventure; if you feel truly daring, the supplemental list also includes a group of "mystery" seeds about which we could find little information other than the names. If you would like to receive the supplementary list, please request it by checking the appropriate box in the seed order form.

Seed Program 1991

We're hard pressed to name the number one reward of gardening, but ranking near the top has to be the feeling you get when you've raised a plant in such abundance that you have enough seed, cuttings, or divisions to share with your friends or neighbors. Start thinking now about sharing your 1990 bounty with the American Horticultural Society's nationwide community of gardeners. Although much of the seed in our catalog is donated by seed companies and botanical gardens, we also depend heavily on donations from members. We would like to see more Society members involved in both the give and take of this program. Particularly if you have any unusual or rare plants in your garden, we hope you will collect the seed and send it to us for the 1991 seed offerings so that it can be shared with American Horticultural Society members.

For information on the 1991 seed program, write to:

Seeds 1991
American Horticultural Society
7931 East Boulevard Drive
Alexandria, VA 22308

General Germination Instructions

The successful germination of seed requires three conditions. First, the seed must be viable; second, the seed must not be dormant; and third, the appropriate environmental conditions must be provided.

Seed viability depends on a number of factors, including growing conditions and storage conditions. Growing conditions are often beyond your control, but you can take simple steps to assure storage conditions that will maintain viability for a reasonable length of time: seeds should be stored in reasonably airtight containers and kept in a place where neither temperature nor humidity varies much.

Some seeds will need your coaxing to overcome dormancy. The procedures usually used to do this are scarification and stratification—sometimes both. These processes will be explained later in the directions. As you read the catalog, you will find at the end of each seed description a code indicating whether germination will require scarification and/or stratification. Those codes are ex-

plained by a chart that will appear several times throughout the catalog.

There are four environmental conditions that need to be controlled:

♦ **Water.** Once a seed takes up water, it must not be allowed to dry out or the seed is lost.

♦ **Temperature.** Most seed will germinate readily at about 70° F. It is best if the temperature is provided by bottom heat from a heating cable (a small heating cable is relatively inexpensive). There is some seed that may germinate best at a lower temperature—about 55° F or 60° F—while other seed require a warmer temperature of about 80° F. These will also be indicated in our chart. Never, however, expose any seed to excessively hot or cold temperatures (below 50° F or above 85° F) after the seed has imbibed water.

Maintaining the optimum temperature will help assure that germination occurs as rapidly as possible; unnecessary delay of germination increases the likelihood of dis-

ease that will kill young seedlings or prevent their germination altogether.

♦ **A well-aerated growing medium.** For indoor planting, use a commercial potting mix composed of sphagnum peat, perlite, and/or vermiculite. Good results can also be obtained for many seed with milled sphagnum or perlite or vermiculite used alone. Do not use ordinary garden soil to germinate seed indoors; no matter how good its quality, it is very unlikely that it will provide adequate aeration when placed in a seed flat. Also, it is highly likely that garden soil is contaminated with organisms that can cause damage to seeds and seedlings. Whatever medium is chosen, it should be thoroughly moistened before being placed in the germinating flats. Make sure that flats have drainage holes.

♦ **The appropriate light level.** Some seed require light for germination and others are inhibited by light. These needs are also indicated in our chart.

Sowing the seed

The seed of many plants, particularly annuals, can be sown safely outdoors where the plant is to grow once the date of the last frost in your area has passed. But with all other plants, or to get an early start with these, you will want to sow seed indoors in seed flats. Those that will eventually be grown outdoors should be started about six to eight weeks before the last frost date.

It is important that the germination medium be disease-free at the outset. The best way to destroy organisms that can prevent germination is to pasteurize the medium. To do this, place a quantity of the moist (but not wet) medium in a tray to a depth of not more than two inches and heat it in an oven for 30 minutes at a temperature of 180° F. As an added precaution, the seed flat may also be drenched with a fungicide formulated to destroy damping-off organisms. This should be done 24 hours prior to sowing the seed.

After the moistened germination medium is put into the seed flat, mark the rows where the seed is to be sown. Most seed should be covered about one and one-half to two times its diameter. However, if the seed you are sowing is very small, there is no need to cover it with the medium; it is sufficient to press it lightly so that it makes contact with the soil. It will help to disperse such seed evenly in the row if you first mix the seed with about three or four times its volume of fine horticultural vermiculite (grade 2).

Avoid sowing seed with different germination times in the same flat. Otherwise, you may find it impossible to transplant the earlier seedlings without disturbing those that germinate later. For the same reason, you should avoid planting seed too close together. Close spacing also encourages disease.

Be sure to label the seed flats with the date and name of the seed sown. It's frustrating to watch something sprout and wonder "What's up?" And you'll find that gathering information on the performance of your plants enhances the fun of gardening.

After sowing, water thoroughly with a fine mist spray until water begins to drain out the bottom of the seed flat. This ensures thorough wetting. Glass works well for covering the tray: it's inexpensive, lets you see when seed has germinated, and a gentle tap will serve to "rewater" the seeds. But plastic or even damp newspaper (for those seeds that do not require light) will serve the purpose. Put the flat on a heating cable, or in any location of suitable temperature. *Do not place the flat in the sun or under any strong light source, especially if you have covered it with glass.* Excessive heat build-up will kill the embryos.

As soon as the young seedlings break the soil surface, remove the glass pane and place the seed flat in indirect lighting or in a well-lit location until ready for transplanting. If you are depending on bulbs to provide light, use fluorescent lighting.

About one week after germination you may begin fertilizing the seedlings with one-quarter strength soluble fertilizer. You may apply it with every watering. When the seedlings are three weeks old, the fertilizer can be increased to one-half strength.

Do not allow seedlings to become excessively dry, but don't overwater either. The seedlings must be kept reasonably moist without being soaked. Too much water encourages disease; too little water causes poor growth.

Transplanting

Transplant the seedlings to individual pots as soon as two true leaves develop. The smaller the seedlings are at transplanting the better they tolerate the shock of transplanting. If you allow the seedlings to become too large before transplanting this may contribute to the failure of the transplant.

Immediately before transplanting, thoroughly water the seed flat and let it drain for about an hour. This will help you to remove the seedlings from the flat more easily and will aid in reducing root injury.

An ordinary kitchen fork makes a good transplanting tool. The tines of the fork will lift the seedlings easily from the flat without contributing to excessive root damage.

After transplanting, water the

transplant thoroughly and place it in a shaded location for about 24 hours. Following this, the transplants may be placed in normal growing conditions.

If the transplants are to grow outdoors they must first be hardened to the new environment. Hardening involves a gradual adjustment to outdoor temperature and light and is accomplished over a period of about three to four days. Beginning a week or 10 days before the hardening process is to be started, gradually reduce watering (but not to the point of allowing the plants to wilt) and stop fertilizing. Then begin the hardening process by moving the young transplants outdoors where they will not be exposed to direct sunlight. On the first day of hardening, the plants should be left outside for about four hours during the morning. Over the next two or three days the plants are left out for longer periods, gradually introducing them to more light until hardening is completed. After this treatment the transplants should be sufficiently acclimated so that they can adapt to permanent placement in the garden.

The seed of trees and shrubs can be handled the same as any other seed, following all the procedures for sowing the seed as outlined, but the young tree or shrub seedlings should be planted outdoors in a protected location for a year or two prior to setting them in their permanent location.

Breaking dormancy

Cold stratification. Seeds that require cold stratification before they are able to germinate should be sealed in a plastic bag with a small amount of moist (but not wet) sphagnum moss or peat moss. Tie the bag closed and place in a refrigerator at 38° F to 40° F for the appropriate time, which may be from one to four months. It is important that the sphagnum or peat not be too wet; otherwise the seed may rot.

Warm stratification. Some seed requires exposure to a period of warm temperatures before the cold stratification treatment begins. The seed is treated exactly as for cold stratification except that it is stored at a warm temperature of 70° F to 80° F for some period of time.

Scarification. Some seed will not germinate because of a hard seed coat and softening or breaking the seed coat is necessary to effect germination. A hard seed coat may be rubbed with sandpaper or a small file to alter it enough so that it can take up water. For some seed, a hot water soak can accomplish this. Soak the seed in five times its volume of hot water (180 to 212° F) for 24 hours. The hot water is poured over the seed and allowed to cool.



On The Cover

The art on the cover of the 1990 Seed Catalog formerly graced the covers of *The National Horticultural Magazine*, the forerunner to *American Horticulturist*, during the late 1940s and early 1950s. The woodblock prints were designed by B. Y. Morrison, a Society founder, president, and editor of its magazine for 37 years. Twelve of these prints have been used to create two sets of notecards—perfect for gifts or greetings to fellow horticulturists. For information on purchasing the cards, see our February magazine.



Annuals

1. *Abelmoschus* spp. Pink abelmoschus. Height: 15 inches. Similar to hibiscus plants. Flowers from mid-summer to fall. Reseeds. G,K [20,56]

2. *Agrostemma githago* 'Milas Rosea'. Corn cockle. Height: 3 feet. Lilac pink flowers with five petals, 3 inches across. Grasslike, gray-green foliage. Spring through early summer. Will self-sow. A,B,L [52]

3. *Anchusa capensis*. Bugloss. Height: 18 inches. Bright blue flowers. Lance-shaped, hairy leaves about 2½ inches long. Summer. L [3]

4. *Chrysanthemum carinatum*. Tri-color chrysanthemum. Height: 2 to 3 feet. Daisylike flowers. White petals are banded with red, orange, and yellow. L [3]

5. *Clarkia amoena*. Satin flower. Height: 3 feet. A spreading plant that prefers light soil. Flowers are pink to lavender with bright red centers. A,B,L

6. *Cleome hasslerana*. Spider flower. Height: 4 to 6 feet. Six-inch flower heads in rose, white, lavender range, mid-summer to autumn. Reseeds. A,B,L [15,56]

7. *Cosmos* 'Bright Lights'. Height: 3 feet. Double, yellow, daisylike flowers. Excellent cut flower. Prefers full sun. A,B,L [25]

8. *Delphinium* spp. Larkspur. Height: 3 feet. Flowers are dark and light blue in early summer. A,B,L [54]

9. *Dianthus armeria*. Deptford pink. Height: 16 inches. Flowers are deep pink, five-petaled and about 1 inch wide. Prefers full sun and average to dry soil. Biennial grown as a hardy annual. A,L [2]

10. *Dolichos lablab*. Hyacinth bean. Tender perennial vine grown as an annual. Flowers pinkish purple, about 1 inch long. Fruit is a purple, flat pod, 2 inches long; seeds black or white. Ornamental member of the pea family; is edible. A,B,L [56]

11. *Eschscholzia californica*. California poppy. Height: 2 feet. Flowers range from deep orange to pale yellow, 2 inches across. Full sun. Blooms the first year, will reseed. L,B [24,25,57]

12. *Grindelia squarrosa*. Gum plant. Height: 2 feet. Daisylike, yellow flowers. Blooms in late summer to fall. Perennial grown as an annual. L

13. *Helichrysum bracteatum*. Strawflower. Height: 3 feet. Daisylike flowers: yellow, red, and white. Blooms from mid-summer until frost. Excellent everlasting flower. A,B,H,L [3]

14. *Hibiscus trionum*. Flower-of-an-hour. Height: 2 feet. Hibiscuslike flowers, yellow to white with very dark, reddish centers. Sometimes self-sows. July to September. A,K [61]

15. *Lagenaria siceraria*. Corsican gourd. Large, 30-foot vine producing small, brightly colored ornamental gourds. A,G [3]

16. *Lavatera trimestris* 'Mont Blanc' and 'Silver Cup'. Height: 3 feet. Mix of silky white flowers and salmon pink flowers with dark rose veins. Chalice-shaped, similar to hollyhocks. Excellent cut flowers. Summer. B [52]

17. *Lobelia erinus* 'Rosamond'. Height: 4 inches. Small dainty flowers; deep carmine red with white edges. Full sun or partial shade, good for edging or rock gardens. Blooms spring. A,K (start indoors 10 to 12 weeks before transplanting outside after frost) [8]

18. *Malva sylvestris* var. *mauritiana*. Malva. Height: 3 feet. Biennial grown as an annual. Flowers in groups of two to six, petals deep rose purple with dark veins. Early spring to late summer. B,L

19. *Mirabilis jalapa*. Common four-o'clock. Height: 2 to 3 feet. Funnel-shaped flowers open about four o'clock in the afternoon. White, yellow, or red flowers about 2-3 inches long. Can treat as an annual and sow seeds in the spring or lift roots in fall and store over winter inside. B,L [58]

20. *Myosotis sylvatica*. Forget-me-not. Height: 9 to 24 inches. Small, five-petaled, blue flowers with white or yellow eyes. Blooms spring to summer. Biennial grown as a hardy annual. L [3]

21. *Nigella damascena*. Love-in-a-mist. Height: 18 to 24 inches. It gets its common name from the way the solitary blue or white flowers appear to nestle in the misty, fernlike foliage. The balloon-shaped seed pods can be used in dried arrangements. Reseeds. Difficult to transplant. B,L [38]

22. *Orthocarpus purpurascens*. Owl's clover. Height: 15 inches. A member of the snapdragon family with hairy, purplish stems bearing spikes of crimson or purple flowers that are tipped with white or yellow and purple markings. Native to southern Arizona and southern California. L

23. *Papaver rhoeas*. Flanders or corn poppy. Height: 3 feet. Stems branching and wiry. Flowers are four-petaled and red to deep purple. B,L [3]

24. *Papaver* spp. Shirley poppy. A strain of the above species. B,L [63]

25. *Rudbeckia hirta* 'Gloriosa Daisy'. Height: 36 inches. Daisylike flowers, golden petals and brown centers. Blooms in summer and fall. Short-lived perennial grown as an annual. A,B,K [37,56]

26. *Rudbeckia hirta* 'Gloriosa Pinwheel'. Height: 3 feet. Single, daisylike flowers with mahogany and gold stripes. A,B,K [8]

27. *Scabiosa atropurpurea* 'Giant Imperial'. Pincushion flower. Height: 3 feet. Pincushion-shaped, 3-inch flowers in blue, white, rose, pink, crimson, lavender. A,B,L [8]

28. *Xeranthemum annuum*. Immortelle. Height: 2 to 3 feet. Flowers: 1½ inches; white, purple, violet, rose. Useful in arrangements both fresh-cut or dried as everlastings. A,B,L [3]

The letters in the following table provide germination information and requirements. For some seed, more than one germination technique may be used. For example, A,B indicates that the seed may be sown indoors or outdoors. Also, some seed require more than one treatment before germination can occur. Db, Eb indicates that a 3-month warm stratification treatment must precede a 60-day cold stratification treatment.

- A May be sown indoors in flats.
- B May be sown outdoors where they are to grow.
- C Sow indoors into peat pots to minimize transplant shock.
- Da Warm stratification of 2 months.
- Db Warm stratification of 3 months.
- Dc Warm stratification of 4 months.
- Dd Warm stratification of 5 months.
- De Warm stratification of 6 months.
- Ea Cold stratification of 30 days.
- Eb Cold stratification of 60 days.
- Ec Cold stratification of 90 days.
- Ed Cold stratification of 120 days.
- F Scarification.
- G Hot-water soak.
- H Light recommended for germination.
- I Dark recommended for germination.
- J Cool temperature required for germination (55° to 60° F).
- K Warm temperature required for germination (80° F).
- L Easy to germinate.
- M Difficult to germinate.
- N No reliable germination information.
- O Sow in fall.



Perennials

29. *Acanthus mollis*. Bear's breech. Height: 2 feet. Basal leaves are 2 feet long and 1 foot wide, hairy on upper surface. Flowers are borne on spikes, rose-colored, white, or lilac. Blooms in August. Zone 8. B

30. *Alcea rosea*. Rose-of-Sharon or hollyhock. Height: 10 feet. Spikes of white, pink, or purple flowers about 2 to 4 inches across. Requires staking. Zone 2 to 3. A,B,J,L [19]

31. *Alcea rosea* 'Nigra'. Same as above but with dark maroon, almost black flowers. [5]

32. *Allium christophii*. Star-of-Persia. Height: 15 inches. Large flowering heads with purple, starlike flowers. June. Good for dried arrangements. Zone 4. B [19]

33. *Allium splendens*. Height: 20 inches. Inflorescence has small, rose-lilac flowers. Zone 4. B [19]

34. *Anaphalis margaritacea*. Pearly everlasting. Height: 2 feet. Gray, slender leaves. Flowers are small, white, and abundant. Used for dried arrangements. Summer to early fall. Zone 4. B [55]

35. *Anemone narcissiflora* and *Anemone nemorosa*. Mix of windflowers. Height: ½ to 1½ feet. Flowers are white. Spring. Zone 3 to 6. L (may take 5 to 6 weeks to germinate) [55]

36. *Anemone patens*. Pasque flower. Height: 6 to 8 inches. An early spring bloomer with violet flowers. Full sun or light shade; good for rock garden. Zone 5. L (may take 5 to 6 weeks to germinate) [13]

37. *Antennaria* spp. Pussy toes. Flowers are white and tubular on the female plant; funnel-form on male. Can grow in poor soils; good rock garden plant. Good for dried flower arrangements. Zone 3. A,J [55]

38. *Aquilegia alpina*. Alpine columbine. Height: 1 foot. Nodding, bright blue flowers in summer. Light shade; moist, well-drained soil. Zone 3. Ea (takes 1 to 3 months to germinate; reducing night temperature is beneficial for germination) [31,34]

39. *Aquilegia discolor*. Height: 6 inches. Dwarf species with tufts of finely-cut leaves and soft blue and cream flowers. Reseeds. Zone 3. Ea (takes 1 to 3 months to germinate; reducing night temperature is beneficial for germination) [19]

40. *Aquilegia flabellata* 'Nana Alba'. Fan columbine. Height: 8 to 10 inches. Leaves are blue-green; flowers are white with short incurved spurs. Blooms late spring. Good for rock garden. Zone 5. Ea (takes 1 to 3 months to germinate; reducing night temperature is beneficial for germination) [19]

41. *Aquilegia vulgaris*. Granny's bonnets. Height: 3 feet. Flowers are blue, purple, white. May to July. Zone 4. Ea (germination takes 4 weeks) [3,26]

Rock gardeners have several excellent specimens to choose from in this year's Seed Program. Purple, spring-blooming pasque flowers (36); nodding white heads of fan columbines (40); and cheery, yellow coltsfoot flowers (140) are great additions to rock gardens. Other favorites are bristle-leaved asters (43), pussy toes (37), and lobelias (17).

42. *Arisaema triphyllum*. Jack-in-the-pulpit. Height: 1 foot. Native North American woodland plant. Prefers cool, shady places. Flowers in early spring and produces orange-red berries. Zone 4. O [30,59]

43. *Aster linearifolius*. Bristle-leaved aster. Height: 2 feet. Leaves are very narrow and wiry. Purple, ray flowers about 2 inches across in the fall. Good for rock garden. Zone 4. L [37]

44. *Belamcanda chinensis*. Blackberry lily. Height: 2 to 4 feet. Tuberous rooted. Flowers: 1½ to 2 inches; orange, spotted red, early summer. Mulch heavily in cold areas. Zone 5. A,B,L [5,33,44,56]

45. *Campanula rapunculoides*. Creeping bellflower. Height: 3 feet. Produces bell-shaped, blue flowers in the summer, about 1 inch long. Can be invasive. Zone 3. A,B,L [30]

46. *Campsis radicans*. Trumpet vine. Flowers are bright orange, trumpet-shaped and 3 inches long. Blooms in late summer. Zone 5. Eb (germinates in 30 days) [10]

47. *Clematis* 'Barbara Jackman'. Clematis. Large flowering hybrid clematis. Flowers are blue-purple with wide crimson bar and creamy stamens. Blooms May, June, and September. Zone 5. L [62]

48. *Clematis ochroleuca*. Clematis. Height: 1½ to 2 feet. Bell-shaped, yellow-green flowers with four sepals reflexed back. Blooms in summer. Zone 5. Ec [2]

49. *Coreopsis* 'Early Sunrise'. Coreopsis. Height: 26 inches. Golden yellow, semi-double flowers. Blooms from early summer to fall. Very showy. Zones 3 to 10. B,L [8]

50. *Dianthus barbatus*. Sweet William. Flowers are small, red, white, pink, and violet. Height varies with this mix. Zone 4. B,L [3,14,25,58]

51. *Dianthus deltoides*. Maiden pink. Height: 4 to 15 inches. Low growing with grasslike leaves. Flowers are red or pink with crimson eyes. Zone 2 to 3. B,L [3,14]

52. *Dianthus plumarius*. Cottage pink. Height: 16 inches. Mat-forming, narrow, gray leaves; small, fragrant flowers. Flowers are purplish and often fringed with rose, purple, or white. May and June. Zone 3. B,L [37]

53. *Dictamnus albus*. Gas plant. Height: 2 to 3 feet. White to pink flowers in summer. Plant, especially seed, is poisonous. Excellent for perennial border. Zone 4. Eb,J (germinates in 30 to 40 days) [13]

54. *Digitalis grandiflora*. Foxglove. Height: 2 to 3 feet. Pale yellow, tubular flowers with brown markings inside. Blooms early June to mid-July. Self-sows. Zone 3. L [45]

55. *Digitalis lutea*. Foxglove. Height: 3 feet. Tall spikes of yellow, bell-like flowers. Needs no staking. Blooms in summer. Zone 4. L [5]

56. *Digitalis purpurea*. Foxglove. Height: 4 feet. Tall flower spikes with purple, pink, white flowers about 3 inches long. Biennial that reseeds itself. Zone 4. A,B,H [47]

Save this catalog!

Seed packets are marked by catalog number only, so it will be your only means of identifying the seeds you have selected.

57. *Erigeron speciosus*. Oregon fleabane. Height: 15 to 30 inches. Purple flowers resembling hardy asters. Good for borders. Blooms in summer. Zone 2 to 3. A,B,L [3]

58. *Fragaria vesca*. European strawberry. Height: 8 to 12 inches. Used primarily as a ground cover, is everbearing with large white flowers and edible red fruit from June to late fall. Zone 5 to 6. A,L [3]

59. *Gaillardia aristata*. Common blanket-flower. Height: 2 to 3 feet. Flowers are yellow, daisylike, and bloom most of the summer. Thrives in dry soils, hot temperatures. Zone 4. A,B,I,L (germinates in 3 weeks) [3,12]

60. *Galium odoratum*. Sweet woodruff. Height: 6 inches. Ground cover with whorled leaves and small white flowers. May to June. Needs shade. Zone 4 to 5. L [3]

61. *Geranium* spp. Hardy geranium. Height: 1 to 2 feet. Blue flowers about an inch across. Zone 4. A,B,L [54]



62. *Gladiolus gracilis*. Gladiolus. Height: 2½ feet. Cylindrical leaves up to 2½ feet long. Flowers fragrant, blue or pale pink. A tender perennial that must be planted in spring, lifted in fall, and stored inside overwinter in Northern areas. [42]

63. *Hesperis matronalis*. Dame's rocket. Height: 3 to 4 feet. Narrow, toothed leaves. White or purple, fragrant flowers produced in loose, terminal racemes. Summer. Zone 2 to 3. L [3,5,30]

64. *Hosta sieboldiana* 'Frances Williams'. Height: 30 inches. Large, round, heavily textured blue leaves with gold border. Lilac flowers in summer. Shade. Zone 4. A,B,L [7,21]

65. *Hosta ventricosa*. Blue plantain lily. Grown primarily for its dark green foliage. Leaves up to 9 inches long and 5 inches wide. Flowers are dark violet. Shade. Zone 3. A,B,L [31]

66. *Iris ensata*. Japanese iris. Flowers are 6 to 9 inches across. Leaves grow to 2 feet. Best grown in humus-rich soil; good for water gardens and banks. June. Zone 5 to 9. O [21]

67. *Iris pseudacorus*. Yellow flag. Yellow-flowered iris with blue-green foliage. Can be grown in moist areas, bogs, and streams. Late spring. Zone 6. O

68. *Leontopodium alpinum*. Edelweiss. Height: 6 to 12 inches. Foliage is silvery white due to short woolly hairs. Flowers are yellow over silvery woolly bracts and bloom in mid-summer. Zone 5. A,B,Ea,H,J [3]

69. *Lilium canadense*. Canada lily. Height: 2 to 5 feet. Flowers are yellow to red, bloom in July. Zone 3. A,B,L [63]

70. *Lunaria annua*. Money plant. Height: 3 feet. Flowers are purple or white and fragrant. Fruit is silvery, papery, and coin-shaped. Biennial that will reseed. Useful for dried arrangements. B,L [2,44]

71. *Lychnis chalconica*. Maltese cross. Height: 2 to 3 feet. Open-growing, branched plant with hairy leaves and stems. Flowers are scarlet; June to July. Zone 4. L (best germination rates at 68° F) [5,61]

Save this catalog!

72. *Moraea polystachya*. Height: 3 feet. Iris-like plant with three to four ribbed leaves. White-purple flowers, yellow blotches at the base of each flower. Zone 9. O [42]

73. *Nicotiana glauca*. Flowering tobacco. Height: 4 feet. Flowers are trumpet-shaped, white inside and greenish white outside. Blooms summer to frost. A tender perennial grown as an annual in North. B,L [5,16,50,58]

74. *Oenothera hookeri*. Giant evening primrose. Height: 2 to 8 feet. Biennial grown as a perennial. Basal rosette of leaves; 2 to 5 inches long and lanceolate. Flowers in terminal spikes, yellow aging to orange-red. Blooms in the evening. Zone 8. L (mulch for winter protection)

75. *Osmorhiza claytonii*. Sweet jarvil or woolly cicely. Height: 3 feet. Leaves up to 1 foot; small, white to yellow flowers in umbels. Fruit is round and up to an inch long. Zone 3. N [30]

76. *Penstemon cyananthus*. Wasatch penstemon. Height: 3 feet. Flowers are bright blue, about 1 inch long, appearing in dense spikes. Zone 3 to 4. L [3]

77. *Platycodon grandiflorus*. Balloon flower (mix of white-flowered and blue-flowered varieties). Height: 3 feet. Balloonlike buds open into star-shaped, 2-inch wide flowers. Blooms June and August. Zone 4. L [54]

78. *Potentilla arguta*. Tall cinquefoil. Height: 3 feet tall. Flowers whitish cream, ½ inch across. Stems are erect and purplish. [61]

79. *Potentilla recta* 'Warrenii'. Sulphur cinquefoil. Height: 1½ to 2 feet. Erect plants with buttercup yellow, summer-blooming flowers up to 1 inch across. Zone 3. A,B,L [17]

80. *Salvia stenophyllum*. Height: 2 feet. Leaves are sticky, aromatic, and about 2 inches long. Plant is topped with spikes of 1 inch, light blue flowers. A tender perennial. L [10]

81. *Saponaria ocymoides*. Rock soapwort. Height: 10 inches. Trailing plant forms a mound of small leaves with reddish branches. Small, dark pink, five-petaled flowers. Peak blooming in late spring but sporadic blooms will appear until fall. Zone 4. A,B,L [19]

82. *Scabiosa caucasica*. Pincushion flower. Height: 2 feet. Blue flowers with flat heads in July and August. Excellent cut flower. Zone 2 to 3. A,B,L (if sown indoors, germinate at 60° to 65° F for 2 weeks) [60]

83. *Schizostylis coccinea* 'Mrs. Hegarty'. Height: 1 to 1½ feet. Narrow, evergreen leaves (plant does best in mild-wintered climates). Spikes of showy, rose pink flowers in fall. Zone 9. (plant in spring, lift in fall, and overwinter inside in Northern areas) [35]

84. *Senecio fendleri*. Groundsel. Height: 18 to 28 inches. Stems are thick with toothed basal leaves. Blooms early summer, yellow flowers. [55]

85. *Silene vulgaris*. Bladder campion. Height: 2 feet. Petals two-lobed, large, and white. Good for rock gardens. Zone 4. L [61]

86. *Sisyrinchium angustifolium*. Blue-eyed grass. Height: 10 inches. A member of the lily family, this grasslike plant bears blue-

Unless otherwise stated, it should be assumed that all plants grown from the seed in this catalog do best in full sun. Also, the "L" symbol, which indicates that the seed is easy to germinate, does not necessarily mean that it is also easy to grow once it has germinated. If you are totally unfamiliar with a particular species, you may want to consult a horticultural reference book or contact Gardener's Information Service here at the Society.

- A May be sown indoors in flats.
- B May be sown outdoors where they are to grow.
- C Sow indoors into peat pots to minimize transplant shock.
- Da Warm stratification of 2 months.
- Db Warm stratification of 3 months.
- Dc Warm stratification of 4 months.
- Dd Warm stratification of 5 months.
- De Warm stratification of 6 months.
- Ea Cold stratification of 30 days.
- Eb Cold stratification of 60 days.
- Ec Cold stratification of 90 days.
- Ed Cold stratification of 120 days.
- F Scarification.
- G Hot-water soak.
- H Light recommended for germination.
- I Dark recommended for germination.
- J Cool temperature required for germination (55° to 60° F).
- K Warm temperature required for germination (80° F).
- L Easy to germinate.
- M Difficult to germinate.
- N No reliable germination information.
- O Sow in fall.

green leaves and small, blue, starlike flowers. Spring-flowering plant requiring moist, well-drained soil and full sun. Zone 3. A,L [2]

87. *Thalictrum polygamum*. Tall meadow rue. Height: 2 to 8 feet. Panicles of delicate white flowers blooming early in summer and into fall. Zone 3. L [2]

88. *Tigridia pavonia*. Mexican shell flower. Height: 2 feet. Foliage is sword-shaped. Flowers are 3 to 6 inches across and a variety of colors. A tender cormous plant that will have to be lifted in fall and replanted in spring in the North. Zone 6. [21,35]

89. *Tulipa tarda*. Tulip. Stem can grow up to 3 inches; leaves, 4 to 7 inches; and flowers, 2 inches. Buds erect, opening to a flat star shape. Red flowers. Zone 4. O [34]

90. *Yucca aloifolia*. Dagger plant. Height: 10 to 25 feet. Leaves are 2 to 3 feet long and 2 to 3 feet wide. Flower are white, about 4 inches long and appear on a panicle 2 feet high. Blooms in late summer. Zone 8. Seeds germinate slowly at 55° F. [51]



Wildflowers

Annuals

- 91. *Anagallis arvensis*.** Scarlet pimpernel. Height: 4 to 12 inches. Tiny but profuse orange to scarlet flowers. Flowers close up during cloudy weather or in late afternoon. June to August. L [3]
- 92. *Asclepias curassavica*.** Bloodflower. Height: 3½ feet. Flowers are bright crimson, about ¾ inch long. Attracts butterflies. Blooms early in season; will reseed. B,L [10]
- 93. *Bidens polylepis*.** Tickseed sunflower. Height: 3 feet. Daisylike, yellow flowers. August through September. Good for naturalizing; will reseed. O [40]
- 94. *Centaurea cyanus*.** Bachelor's button. Height: 2½ feet. Blue flowers. June to September. Tolerates light shade. B,L [3]
- 95. *Clarkia unguiculata*.** Height: 3 feet. Summer flowers are rosy red, 2½ inches wide. Native to California. Reseeds. B,L [17]
- 96. *Coreopsis tinctoria*.** Height: 3 feet. Flowers: daisylike, yellow and maroon, summer to fall. Reseeds. B,L [3,57]
- 97. *Coreopsis tinctoria*.** A dwarf, red-flowering variety of the above. [17]
- 98. *Dimorphotheca pluvialis*.** Rain cape marigold. Height: 16 inches. Summer flowers have yellow centers, with white petals that are purple underneath. Reseeds. Low water requirement. G,L [17]
- 99. *Gilia leptantha* var. *purpussi*.** Height: 3 feet. Flowers: blue, violet, white, May to August. Native to California. B,L
- 100. *Linaria maroccana*.** Toadflax. Height: 18 to 24 inches. Flowers: bicolor of yellow, and red, pink, white, or purple. Spring and summer. Reseeds. Low water requirement. B,L [17]
- 101. *Linum grandiflorum* var. *rubrum*.** Scarlet flax. Height: 12 to 18 inches. Flowers: red, summer. Drought-resistant. Tolerates light shade. B,L [3,10,12,25]
- 102. *Linum usitatissimum*.** Flax. Height: 4 feet. Flowers are blue, sometimes white, ½ inch across in terminal leafy panicles. B,L [10]
- 103. *Lupinus densiflorus* (mixed).** Lupine. Height: 2½ feet. Flowers: purple, rose, yellow, cream, spring and summer. Reseeds. B,L [17]
- 104. *Lupinus densiflorus* var. *aureus*.** A yellow flowering form of the above. B,L [17]
- 105. *Matricaria recutita*.** German

chamomile. Height: 2 feet. White, daisylike flowers are used to make tea. B,L [3]

- 106. *Nemophila menziesii*.** Baby blue eyes. Height: 30 inches. Blue, cup-shaped flowers with white centers. Leaves are tufted and form a rosette. Spring. L [57]
- 107. *Phacelia campanularia*.** California bluebell. Height: 8 to 20 inches. Flowers: blue, spring to summer. Drought tolerant. L [17]
- 108. *Silene armeria*.** Catchfly. Height: 1 to 2 feet. Flowers: rose pink, verbena-like, mid- to late-summer. B,L [3,17]
- 109. *Silene pendula*.** Drooping catchfly. Height: 10 inches. Like the *Silene armeria*, useful in the rock garden. B,L [17]

Perennials

- 110. *Achillea millefolium*.** Yarrow. Height: 4 feet. Aromatic, fernlike foliage and clusters of whitish pink flowers. Excellent for dried arrangements. Zone 3. L [2]
- 111. *Achillea millefolium* 'Rubra'.** A red-flowering form of the above. [3]
- 112. *Allium giganteum*.** Giant onion. Height: 3 to 4 feet. Globose inflorescence on top of erect tall stalk is made up of many tiny lilac-pink flowers. Late spring to early summer. Zone 5. Seed sown in spring will bloom in two to three years. [13]
- 113. *Aquilegia canadensis*.** Wild columbine. Flowers are yellow with long red spurs. Prefers rich, moist, well-drained soil, shade. Spring. Zone 3. A,B,Ea,H,L [13,19,29]
- 114. *Aquilegia canadensis* 'McKana's Giant'.** Height: 30 inches. Mixed colors. Long spurs. Zone 3. A,B,Ea,H,L [9]
- 115. *Asclepias tuberosa*.** Butterfly weed. Height: 3 feet. Tiny, bright orange flowers from June to September. Attracts butterflies. Zone 3. L [2]

116. *Aster umbellatus*. Flat-top aster. Height: 2 feet. White flowers in a dense, flat-topped corymb. Fall. Zone 4.

- 117. *Castilleja miniata* var. *miniata*.** Giant red paintbrush. Height: 2½ feet. Leaves lanceolate; 2 inches long. Flowers are scarlet; blooms in summer. Zone 3. N [23]
- 118. *Centaurea macrocephala*.** Globe centaurea. Height: 4 feet. A large, coarse plant with yellow, thistlelike flowers in June and July. Specimen plant; flowers useful in dried arrangements. Zones 2 to 3. O [58]
- 119. *Coreopsis lanceolata*.** Tickseed. Height: 1 to 3 feet. Stems are erect; leafy at base and leafless at top. Flowers are 2 to 2½ inches across; bright yellow. Zone 3. A,B,H,L [12,40,57]

120. *Daucus carota*. Queen Anne's lace. A tap-rooted biennial treated as a perennial. Small, white flowers borne on large, compound umbels from July to September. Used in dried flower arrangements. Graceful but can be invasive. Zone 3. O [37]

121. *Dyssodia acerosa*. Height: 4 to 10 inches. A mosslike plant with threadlike, ½ inch long leaves. Flowers are daisylike, lemon yellow in color. N

122. *Echinacea purpurea*. Purple cone-flower. Height: 2 to 3 feet. Pinkish purple flowers with dome centers; petals reflex slightly down. Blooms summer to fall. Zone 3. A, (30 day cold stratification will improve germination) [12,22,61]

123. *Eupatorium cannabinum*. Hemp agrimony. Height: 4 feet. Flowers in the summer, reddish mauve to whitish flowers in dense corymbs. Zone 4. B,L [58]

124. *Eupatorium purpureum*. Bluestem Joe-Pye weed. Height: 10 feet. Flowers are open, rounded panicles ranging from pink to purplish; rarely white. Summer flowers attract butterflies. Zone 4. B,L [1]

125. *Geum triflorum*. Prairie smoke. Height: 12 to 18 inches. Flowers in April through June. Flowers are small, reddish brown, pink to purple; leaves are deeply dissected. Unique fruiting stalks have long, feathery hairs. B,L,O [55]

126. *Hypericum ascyron*. Great St. John's wort. Height: 4 feet. Yellow flowers, 2 inches across. Summer. Zone 3.

127. *Juncus effusus*. Bog rush. Height: 4 feet. Grasslike bog plant. Blue-green, round

Many of our wildflowers this year have the exciting bonus of attracting butterflies—perfect for both wildflower meadows and butterfly gardens. Two species of milkweed—a butterfly's favorite dish (92,115)—are offered plus Queen Anne's lace (120), rudbeckia (138,139), gay-feather (129), coneflower (122), tickseed (119), bluestem Joe-Pye weed (124), coreopsis (96), and yarrow (110). These are among our more popular selections so be sure to send in your seed order as soon as possible!



but pointed stems. Must have moist soil; excellent for ponds and streams. Zone 3. L [2]

128. *Kosteletzkya virginica*. Seashore mallow. Height: 5 feet. Flowers are pale to deep pink, hibiscuslike, and 2 inches across. September. Zone 6. O [40]

129. *Liatris* spp. Gay-feather or blazing star. Height: 1 to 3 feet. Erect spikes of small, purple flowers. Prefers moist, rich soil and full sun. Zone 4. A,B,L [24,46]

130. *Linum lewisii*. Blue flax. Height: 2 feet. Delicate sky blue flowers on lacy plants. Relative of the flax used in fabric. Zone 4. L [57]

131. *Lobelia cardinalis*. Cardinal flower. Height: 4 feet. Brilliant red, tubular flowers, 1 to 1½ inches long. July to September. Zone 3. L [2,56]

132. *Lobelia siphilitica*. Great lobelia. Height: 1 to 3 feet. Dense racemes of beautiful blue flowers in late summer. Zone 5. L [30]

133. *Lomatium nudicaule*. Pestle parsnip. Height: 2 feet. Inflorescences are flat heads of small yellow flowers. Fernlike, deeply dissected leaves, about 8 inches long. Zone 7 to 9. N [1]

134. *Lupinus perennis*. Wild lupine. Height: 1 to 2 feet. Blue flowers bloom May to July. Seed poisonous. Zone 4. B,L [3]

135. *Malva moschata*. Musk mallow. Height: 3 to 4 feet. Red-purple flowers bloom June to July. Tends to be invasive. Zone 3. B,L [1,61]

136. *Penstemon digitalis*. Foxglove beard-tongue. Height: 5 feet. Panicles of small, whitish pink flowers in late spring. Self-sows. Zone 3. L [2]

137. *Prenanthes aspera*. Rattlesnake root. Height: 4 feet. Creamy, nodding flowers in fall. N

138. *Rudbeckia fulgida* var. *sullivantii*. Coneflower. Petals are yellow-orange, 2 inches long; centers are brownish purple. Zone 4. A,B,L (sow when soil is warm) [40]

Save this catalog!

Seed packets are marked by catalog number only, so it will be your only means of identifying the seeds you have selected.

139. *Rudbeckia triloba*. Brown-eyed Susan. Height: 5 feet. Flower petals are deep yellow to orange; centers are brown to black-purple. Biennial. A,B,L (sow when soil is warm) [30]

140. *Tussilago farfara*. Coltsfoot. Height: 1 foot. Sends up flowers before leaves in early spring. Flowers are small, yellow, daisylike. Tolerates wide variety of conditions; rock gardens or banks. Zone 3. O [2]

Grasses

141. *Agrostis nebulosa*. Cloudgrass. Height: 12 to 18 inches. Delicate and graceful. Derives its name from clusters of small white flower spikes that resemble clouds. Cut for dried arrangements. Native to Spain. Annual. L [3]

142. *Phalaris arundinacea picta*. Ribbon grass. Height: 4 feet. Striped white and green leaves about 6 to 12 inches long and ¾ inch wide; similar to a small bamboo. Will adapt to poor soils and wet conditions. Flowers in June

through August. Can be invasive. Perennial. Zone 3. L [13]

143. *Setaria italica*. Green foxtail. Height: 3 feet. Used for fresh or dried arrangements. Birds feed on the seed. Good accent plant. Annual. L [8]

144. *Sorghum bicolor*. Broomcorn. Height: 12 feet. Rapidly growing, coarse-textured grass used for making brooms. Annual. L [10]

Trees and Shrubs

145. *Acer miyabei*. Miyabe maple. Height: 30 to 40 feet. Has an upright, oval form. Zone 4. Ec,L

146. *Acer paxii*. Height: 30 feet. An evergreen maple with three-lobed, thick and leathery leaves. Seed pods (samaras) have wings diverging at right angles. Zone 7. N (Ec is probably helpful)

147. *Alnus glutinosa*. Black alder. Height: 40 to 60 feet. Grows quickly and does well in wet areas. Has a pyramidal habit and makes a good ornamental tree. Zone 3 to 7. Ec,L

Create a unique garden by planting the Chinese paper birch (148), a little-known but beautiful tree introduced from China in the early 1900s. It has a rounded shape and exquisite bark character: a rich orange-red that peels off in sheets with a white glaucous bloom. Excellent for year-round interest and hardy up to Zone 5.

148. *Betula albo-sinensis*. Chinese paper birch. Height: 60 feet. A rare Chinese birch with bright orange to orange-red exfoliating bark. Foliage is dark yellow-green in summer changing to yellow in fall. Excellent specimen for winter interest. Zone 5. Eb,H [48]

149. *Betula lenta*. Sweet birch. Height: 40 to 55 feet. Is resistant to the bronze birch borer. Has a pyramidal form when young and a rounded, spreading habit when mature. Fall color is golden yellow; known for having the best fall color of all birches. Zone 3. Ea,H,L

150. *Calycanthus floridus*. Carolina allspice. Height: 6 to 9 feet. Deciduous shrub with dark, ribbon flowers in May and June. Brown, urn-shaped fruit in fall. Flowers, leaves, and stems are very fragrant. Very disease- and insect-resistant shrub. Zone 4. Ec [12]

151. *Celastrus scandens*. American bit-

tersweet. Deciduous, climbing or twining shrub that will grow to 25 feet with support. Bright, orange-red fruit in fall; used for indoor arrangements. Need both male and female plant for fruit production. Zone 2. Ed [41]

152. *Cercidiphyllum japonicum*. Katsura tree. Height: 40 to 60 feet. An excellent specimen with fast early growth. Has bluish green leaves that change to yellowish orange in the fall. Difficult to transplant. Zone 4 to 8. L

153. *Cornus capitata*. Evergreen dogwood. Height: 40 feet. A Chinese native, this tree has semi-evergreen to evergreen leaves that turn bronze in winter. Pale yellow flowers in summer; red, strawberrylike fruits in fall. Round, bushy habit. Zone 7. N

154. *Cornus kousa*. Oriental dogwood. Height: 21 feet. Deciduous tree, similar to *Cornus florida*. Pointed white bracts in the spring and red, raspberrylike fruit in fall. Zone 5, Ec [59]

155. *Crataegus phaenopyrum*. Washington hawthorn. Height: 30 feet. An excellent hawthorn: many white flowers, scarlet fruit, and beautiful orange to red autumn foliage. Zone 4. Dc, followed by Ed

156. *Crataegus viridis*. Green hawthorn. Height: 40 feet. Deciduous tree with thorns about 1½ inches long. Flowers white, May. Fruit is red to red-orange, coloring in fall and persisting. Excellent fall color. Zone 5. Dc, followed by Ed [46]

157. *Eriobotrya japonica*. Loquat. Height: 25 feet. Widely cultivated as a sub-tropical ornamental and for edible fruit produced only in warm climates. Fruit 1½ inches long and yellow. Zone 7. O [25]

158. *Erythrina herbacea*. Eastern coral-bean. Height: 2 to 3 feet. Stems will die back each year. Triangular leaves; scarlet flowers 2 inches long. Fruit are 5-inch pods. Zone 8. G



159. *Evodia daniellii*. Korean evodia. Height: 25 feet. Rare, small tree, native to China and Korea. Small white flowers in 6 inch clusters. Red fruit splits open to reveal black seeds. Early summer. Zone 5. O [4]

The Korean evodia (159), an excellent small tree with few pest or disease problems, is a landscaping gem. Not only does it provide year-round interest but it is one of the few trees to flower in the middle of summer. The pinnately compound, dark green leaves create an airy, light texture and in June and July, the tree becomes covered with white flowers. Afterwards masses of fruits appear, splitting open to reveal small, shiny black seeds.

160. *Fraxinus bungeana*. Ash. Height: 15 feet. A small ash native to China. Zone 4. N, (Ec probably helpful)

161. *Gleditsia triacanthos*. Honey locust. Height: 70 feet. Open, spreading crown, fast growing. Leaves are pinnately and bipinnately compound; seed pods are brown and up to 8 inches long. Zone 3 to 9. F,L

162. *Gymnocladus dioica*. Kentucky coffee tree. Height: 60 to 75 feet. A good tree for large areas but slow-growing. Leaves are bipinnately compound; brown seed pods are 5 to 10 inches long. Zone 3 to 8. F,L

163. *Koeleruteria paniculata*. Golden-rain tree. Height: 40 feet. Dense, rounded outline with yellow flowers that bloom in early sum-

mer. Leaves are pinnately or bipinnately compound. Fall seed pods resemble miniature Chinese lanterns. Zone 5 to 9. Ec,F

164. *Kolkwitzia amabilis*. Beautybush. Height: 15 feet. Deciduous shrub. Flowers pink, late May to early June. Red autumn foliage. Fast growing. Zone 4 to 8. L

165. *Leucaena leucocephala*. White popinac tree. Resembles mimosa or acacia trees. Has white flowers. Very fast growth rate: 65 feet in seven years. Zone 9. G [56]

166. *Paulownia tomentosa*. Empress tree. Height: 45 feet. Fast-growing tree similar to the catalpa tree in texture and shape. Flowers are large and violet. Fruit capsules are dry, brown open "nuts" arranged in a pyramidal fashion. Tolerates a wide variety of soils, conditions, and pollution. Zone 5. H,L [6]

167. *Platycarya strobilacea*. Platycara. Height: 40 feet. Deciduous tree. Leaves are up to 4 inches long. Flowers are male and female catkins. Zone 6. N [4]

168. *Poncirus trifoliata*. Hardy orange. Height: 15 to 20 feet. Green stems and broad spines. Flowers are 2 inches across, white, and very fragrant. Fruit is small, round, and yellow, ripening in fall. Can be used as a dense, thorny hedge. Zone 5. Ec [51]

169. *Pyrus pyrifolia*. Chinese sand pear. Height: 40 feet. Pyramidal-round ornamental pear tree that flowers profusely in spring creating white cloudlike effect. Small, simple leaves; small, brown, hard fruits. Zone 5. Eb to Ec [48]

170. *Quercus imbricaria*. Shingle oak. Height: 60 feet. Excellent oak for landscape; deciduous, narrow, oblong leaves and russet fall color. Can be grown as a clipped hedge. Zone 5. Eb or O [53]

171. *Rhodotypos scandens*. Black jetbead. Height: 6 feet with a 9-foot spread. Loosely branched shrub. Flowers are white. May to early June. One of the better shrubs for poor conditions and heavy shade. Fast growing. Zone 4 to 8. Da,Ea,M

172. *Sambucus melanocarpa*. Elderberry. Height: 6 feet. Deciduous shrub with fast growth and coarse texture. Small, yellow-white flowers in late spring; black fruit in summer. Zone 6. Ec [39]

173. *Syringa pekinensis*. Peking tree lilac. Height: 15 feet. June flowers are yellowish white. Purplish, peeling bark. Zone 3 to 7. Da,Eb

174. *Ulmus parvifolia*. Chinese elm. Height: 40 to 50 feet. Has a graceful, round-headed habit. Resistant to the Dutch elm disease, elm leaf beetle, and the Japanese beetle. Easy to grow. Zone 4 to 9. Eb,L

175. *Viburnum prunifolium*. Black haw. Height: 15 feet. A round-headed, small, hawthornlike tree with white flowers, early June. Has blue-black fruit. One of the best viburnums for the North. Zone 3. De,Ec,M

176. *Vitex agnus-castus*. Chaste tree. Height: 10 feet. Deciduous shrub with masses of lilac flowers in late summer. Fast growing. Zone 6. Ec or O [10]

Vegetables

177. Beet 'Early Wonder'. Smooth skin and semi-globe shape; about 2½ to 3 inches in diameter. Used for table, canning, and pickling. Matures in 55 days. B,L [8]

178. Broccoli 'Cape Queen'. Produces heavy center head followed by many side shoots. Matures in 64 days.

179. Cabbage 'Danish Ballhead'. Keeps well in storage. Matures in 100 days.

180. Carrots. Baby and mini. Roots are small, deep orange to red, and ball-shaped. Tender and sweet-tasting. Matures in 68 days. B,L

181. Cauliflower 'Stovepipe'. Performs well in summer but has no fall frost resistance. Matures in 47 days.

182. Cauliflower 'Tropical Pride'. Matures in 52 days.

183. Cauliflower 'White Empress'. Performs well in summer but lacks fall frost resistance. Medium-sized head. Matures in 61 days.

184. Celtnce. Combines the uses of celery and lettuce. Leaves are used for salad or boiled. Heart of stem tastes like celery and can be eaten raw or boiled. Grows like lettuce. Matures in 75 days for foliage harvest; 90 days for stalk harvest. B,L [8]

185. Chicory. A perennial vegetable, the foliage has a sweet, tangy taste, excellent for salads. It forms tight heads that are cabbage-like in appearance. Zone 5. B,L [3]

186. Endive, French curly 'Elodie'. Foliage is grown and eaten like lettuce or used to garnish dishes. A cool-weather plant usually grown in late summer to winter. This particular variety is more heat-resistant. 70 days. [52]

- A** May be sown indoors in flats.
- B** May be sown outdoors where they are to grow.
- C** Sow indoors into peat pots to minimize transplant shock.
- Da** Warm stratification of 2 months.
- Db** Warm stratification of 3 months.
- Dc** Warm stratification of 4 months.
- Dd** Warm stratification of 5 months.
- De** Warm stratification of 6 months.
- Ea** Cold stratification of 30 days.
- Eb** Cold stratification of 60 days.
- Ec** Cold stratification of 90 days.
- Ed** Cold stratification of 120 days.
- F** Scarification.
- G** Hot-water soak.
- H** Light recommended for germination.
- I** Dark recommended for germination.
- J** Cool temperature required for germination (55° to 60° F).
- K** Warm temperature required for germination (80° F).
- L** Easy to germinate.
- M** Difficult to germinate.
- N** No reliable germination information.
- O** Sow in fall.



187. Kale 'Red Russian'. Can be used as ornamental or as vegetable. Foliage resembles a large oak leaf; turns red in winter. Very hardy. 55 days. [43]

188. Lettuce 'Rouge d'ttires'. Red romaine lettuce with large, broad leaves. Use for salads, sandwiches, or garnish. 60 days. [52]

189. Lettuce 'Royal Oak Leaf'. Heat-tolerant, long-standing lettuce with large, oak-shaped, dark green leaves. 50 days. [8]

190. Mustard 'Red Salad'. Deep red leaves. Flavor is like Dijon mustard. Cool season crop.

Great for salads. B,L [52]

191. Pak choi 'Hon Tsai Tai'. A yellow-flowering type of pak choi. Harvest purple stalks; eat fried or boiled. A cool weather plant. 50 days. [22]

192. Pak choi 'Lei Choi'. Chinese cabbage. This Chinese member of the cabbage family has crispy, thick stalks and dark green top leaves. Stir-fry or use in Oriental dishes. 45 days. [52]

193. Pumpkin 'Mini Munchkin'. Miniature version of old-fashioned pumpkins, these

reach only 3 to 4 inches in diameter. Is both ornamental and has a sweet flavor. Matures in 85 days. B,L [52]

194. Tomato 'Coldset'. Performs well in cool, early spring weather. Bushy, compact plant with fruit weighing six ounces. Matures in 70 days.

195. Turnip 'Milan Red Top'. Matures in 35 days.

196. Watermelon 'Early Kansas'. Round with a striped rind and fine textured flesh. Weighs 30 pounds. Matures in 80 days.

Herbs

197. Anise basil. *Ocimum basilicum*. Annual. Used in Thai and Cambodian cuisine and in Italian dishes. Vigorous plant with rose-colored flowers. A,B,L [52]

198. Anise hyssop. *Agastache foeniculum*. Height: 3 feet. A member of the mint family, this perennial herb has spikes of blue flowers and leaves that smell of aniseed. Dried leaves are used in seasonings, potpourri, and tea. Zone 4. A,B,L [10]

199. Catnip. *Nepeta cataria*. Height: 3 feet. Flowers are white to purple, small but borne on spikes 5 inches long. Blooms July to September. Cats love the fragrance of the leaves. A true mint, this plant can become invasive. Zone 3. L [3]

203. Egyptian fennel. *Foeniculum* spp. Height: 4 feet. Semi-hardy perennial; often cultivated as an annual. Grown for its stems, leaves, and seeds. July through October. A,L

204. Florence fennel (finocchio). *Foeniculum vulgare* var. *dulce*. A perennial grown as an annual. Height: 3 to 4 feet. Leaves have anise flavor. Used for seasoning, salads, eggs, fish, and sauces. Stems can be cooked and eaten as a vegetable. A,L [8]

205. Garlic chives. *Allium tuberosum*. Height: 1½ feet. Fragrant, globose umbels of small, white, starlike flowers. Mild garlicky taste, perfect for omelets, salads, and Oriental cuisine. Zone 4. A,B,L [10]

206. Hyssop. *Hyssopus officinalis*. Height: 1½ to 2 feet. Flowers are ½ inch long and deep, blue-violet. The dried flowering tops and leaves are used in herbal medicines. Does well in dry, rocky soil. Zone 4 to 5. A,B,L [25]

207. Italian parsley. *Petroselinum crispum* var. *neapolitanum*. Biennial. Leaves are flat. Most flavorful of all parsleys. Leaves are used as garnish and for seasoning soups and other dishes. B,G,I,L [3]

208. Kablouna calendula. Annual. Height: 20 inches. Edible gold and orange flowers add color and flavor to egg and cheese dishes and salads, saffronlike flavor to rice dishes. Prefers cool temperatures. Will bloom through fall. A,B,I,L [52]

209. Licorice basil. *Ocimum* spp. Height: 2 to 3 feet. Annual basil with licorice flavor. Light purple flower spikes. A,B,L [8,10]

210. Perilla. *Perilla frutescens*. (Green-leaf form) Annual. Attractive, crinkled, lime green leaves. Flavor is different than the purple perilla, with a heavy, sweet aftertaste. Used in Oriental cooking. A,B,L [10]

211. Perilla. *Perilla frutescens*. (Purple-leaf form) Annual. Fresh leaves used to flavor pickles and cucumbers. Attractive red-purple plant that vigorously self-seeds. Used in Oriental cooking. A,B,L [10]

212. Sweet marjoram. *Origanum majorana*. Annual. Height: 2 feet. Has minute white-pink flowers that bloom in mid-summer. Foliage can be used as a milder alternative to oregano for meats and Italian dishes and as a headache cure. B,L [3]

213. Tansy. *Tanacetum vulgare*. Herbaceous perennial. Height: 3 feet. Flowers are yellow and buttonlike. Foliage is strongly scented and finely divided giving a lacy appearance. Zone 3. A,B,L [3]

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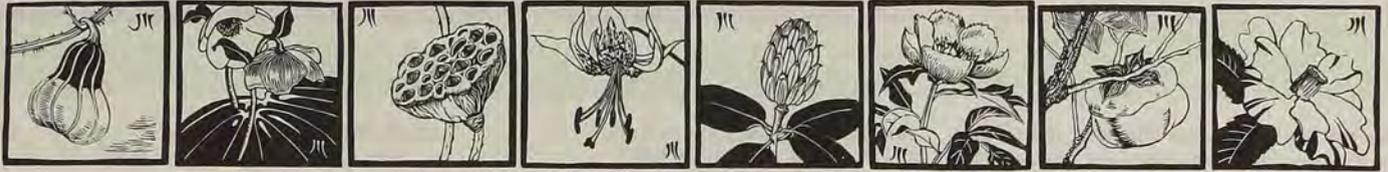
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200. Chervil. *Anthriscus cerefolium*. Height: 18 inches. Leaves have an anise-parsley flavor and are used for flavoring soups, fish, meats, or salads. An annual member of the carrot family. Excellent as a pot plant or indoor herb plant. A,B,L

201. Coriander. *Coriandrum sativum*. Height: 1 to 3 feet. Annual member of the carrot family. Delicate plant with lacy foliage. Seeds (coriander) are used for baking and flavoring; foliage (cilantro or Chinese parsley) is used for Oriental and Mexican cooking. A,B,L [10]

202. Dill. *Anethum graveolens*. Height: 3 to 4 feet. Annual, reseeds. A tall plant with feathery foliage. Used as flavoring for pickling, potato salads, and meat dishes. B,L [3,31]

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- K Warm temperature required for germination (80° F).
- L Easy to germinate.
- M Difficult to germinate.
- N No reliable germination information.
- O Sow in fall.



Plants for Home or Greenhouse

The plants listed below can be grown outside only in Zone 10 unless otherwise noted.

214. *Calliandra eriophylla*. Fairy-duster. Height: 1½ feet. Woody shrub. Flowers are reddish purple, pubescent. Fruit is densely pubescent. L [25]

215. *Cereus eriophorus pfeiffer* var. *fragrans*. Long-stemmed cactus with deep ridges and short spines. Funnel-shaped flowers bloom at night. A,H,K (after germination, increase light and keep soil dryer than usual) [18]

216. *Clitoria ternatea*. Butterfly-pea. Loosely twining vine with bright blue flowers and light blue and yellow markings. Fruits are pods, 4½ inches long. L [24]

217. *Coryphantha obscura*. Cactus. Round, 4-inch diameter with spirals of tubercules about ¾ inch long. Heavy, thick spines, ¾ inch long. Yellow flower, early summer. Zone 7. A,H,K,L (after germination, increase light and keep soil dryer than usual) [36]

218. *Echinocereus chloranthus*. Cactus. Small, barrel-type cactus with ribs and a close covering of fine spines, ¼ inch long. Green-brown flowers, 1 inch, in early spring. Zone 6. A,H,K,L (after germination, increase light and keep soil dryer than usual) [36]

219. *Echinocereus fasciculatus*. Cactus. Forms clumps up to 18 inches across. Flowers are magenta. A,H,K,L (after germination, increase light and keep soil dryer than usual) [3]

220. *Harrisia brookii*. Brook's dildo. Thin, long-stemmed cactus with night-blooming,

funnel-shaped flowers. Yellow to orange-red fruits. A,H,K (after germination, increase light and keep soil dryer than usual) [18]

221. *Mammillaria louisae*. Cactus. Very small, flat to the ground with big pink flowers. Summer. Susceptible to water rot; requires gritty soil. Zone 9. A,H,K,L (after germination, increase light and keep soil dryer than usual) [36]

222. *Mammillaria morricalli*. Cactus. Globose plant, 2 inch diameter with hooked spines. Coppery orange flowers. Early summer. Zone 5. A,H,K,L (after germination, increase light and keep soil dryer than usual) [36]

223. *Massonia pustulata*. South African bulb. Stemless inflorescence, nestled within leaves on the ground. Flowers are a rounded mass of erect, off-white stamens. Blooms mid-to late winter. Sow seeds in late summer, barely covering seeds. Will flower in approximately three years. [11]

224. *Mimosa pudica*. Sensitive plant. Height: 18 inches. Leaflets fold when touched. Flowers resemble small pinkish purple puffs. Should not be confused with *Albizia julibrissin*, commonly called the mimosa, which is abundant and hardy throughout the Southern United States. Can be grown as a summer annual. Does not do well as a houseplant. Requires evenly moist soil, diffused light. L [3]

225. *Opuntia imbricata*. Walkingstick cholla or chain-link cactus. Height: 10 feet. Treelike cactus with 2 inch long, purple flowers. Yellow, 1½ inch long fruit. Zone 4. A,H,K,L (after germination, increase light and keep soil dryer than usual) [3]

226. *Passiflora edulis*. Passion flower. Climbing habit. Flowers are white with white and purple crown. Edible fruit is 3 inches long. N [3]

Some Good Books

If you feel in need of guidance in starting your seed, the AHS Book Program offers two useful publications. *The New Seed-Starters Handbook* by Nancy Bubel is a thorough, basic how-to that addresses such diverse topics as soil preparation, using seaweed extract, cold frames, helping children garden, and saving, storing, and finding seed. Written from the standpoint of an organic vegetable gardener, it includes information on starting seed of 200 plants, including trees and wildflowers. Publisher's price, hardcover: \$14.95. AHS member price: \$12.50.

Park's Success With Seeds by Ann Reilly is recommended by members and AHS horticulturist Donna Matthews. Shorter on general information, its strength is a 150-page encyclopedia on individual plants with color photos of seedlings: especially useful if you lose a label or have doubts about yanking up a volunteer. Publisher's price, hardcover: \$14.95. AHS member price: \$12.50. See page 13 of the News Edition to order.

227. *Solanum seforthianum*. Brazilian nightshade. Height: 10 feet. Tropical vine. Blue-purple flowers in large clusters, starlike. Fruit are small, bright red. Zone 10. [32]

228. *Solanum seforthianum* var. *alba*. Brazilian nightshade. A white-flowering form of the above. [32]

229. *Thelocactus bicolor* var. *bolansis*. Cactus. Height: 1 foot and 4 inches in diameter. Wide and rounded ribs; red-yellow spines about 1 inch long. Large magenta flowers with light-colored eyes. Summer. Zone 7. A,H,K,L (after germination, increase light and keep soil dryer than usual) [36]

Free Advice!!

Have questions about seeds, sources, fungus, or fertilizer? We'd like to help you solve your gardening problems. Write to us here at River Farm or take advantage of our toll-free number to call Gardener's Information Service.

1 (800) 777-7931

This is a free service—one of your AHS membership benefits! We have an extensive reference library, plus staff horticulturists who can answer questions about plant care or help you find sources for gardening tools, plants, and accessories.

Tropical Trees for Zone 10

230. *Annona cherimola*. Custard apple. Height: 25 feet. Flowers are small, fragrant, and yellow-brown. Fruit is globose to heart-shaped, light green, and about 5 inches long. Fruit is edible, produced in the summer, and used for dessert dishes. N [11]

231. *Camptotheca acuminata*. Height: 75 feet. A deciduous tree, fast growing, and a good shade tree. Leaves are 6 inches long with attractive blooms. L

232. *Cassia spectabilis*. Height: 40 to 50 feet. Flowers are 1½ inches across and bright yellow. N

233. *Erythrina variegata*. Coral tree. Height: 30 to 60 feet. Red flowers in mid-winter, early spring. Requires rich soil. Allow to dry between waterings. Takes 2 months to germinate. G [51]

Thanks to our donors!

We are grateful to the following individuals, businesses, and organizations whose donations of seed made this year's program possible:

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Gardener's Q&A

Q: This past fall my neighbor's azalea bush bloomed again and a friend's lilac bush also rebloomed. Why are they blooming again in the fall and is it something to worry about?

L. C., Alexandria, Virginia

A: It is not uncommon for some azaleas, lilacs, irises, and daylilies to bloom again in the fall in a reaction to springlike environmental conditions. In mid-summer, after these plants have bloomed for the first time, they set flower buds. In the fall we often get a cold spell followed by Indian summer: warm, sunny days much like spring. The plant, fooled by cool weather followed by warm weather, reacts as if it is spring and flowers again. Your friends should not worry; this is a natural reaction that does not harm the plant. Nor should you worry if your plants don't rebloom.

Q: I have a small pond on my property that I would like to landscape. I am concerned that the edge of the pond might erode, so I would like to plant attractive yet stabilizing waterlovers that enjoy full sun. Can you suggest any plants?

M. K., Morgantown, Pennsylvania

A: There are many water-loving plants suited for pond culture. Foliage plants that will help prevent erosion when planted around the pond bank include arrowheads, water arums, dwarf bamboos, thalias, rushes, cattails, and horsetails.

Flowering plants that will add color and beauty to your pond area include spider lilies, water-loving irises, water cannas, and the Longwood hybrid cannas.

Q: I have been planting dahlias for several years now, but I have noticed something odd about some new red- and yellow-flowering types. When I dug up the tubers this past fall, I found that they hadn't increased in size like my other tubers. They are exactly the same size as when I planted them in the spring. Why is this?

D. T., Wallace, Michigan

A: If all of your tubers were failing to increase in size, then I would say you are likely to have a fertilizer problem. Dahlias need potash and superphosphate in a 0-20-20 combination applied in spring as they are planted. But since only these particular cultivars are

not getting larger, then it is probably just a cultivar characteristic. Some cultivars don't increase very much and some do. Your tubers might have been bred for beautiful flowers but not for significant increases in tuber size.

—Peggy Lytton



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Gardener's Bookshelf

Rodale's LANDSCAPE PROBLEM SOLVER



A Plant-by-Plant Guide
by Jeff and Liz Ball

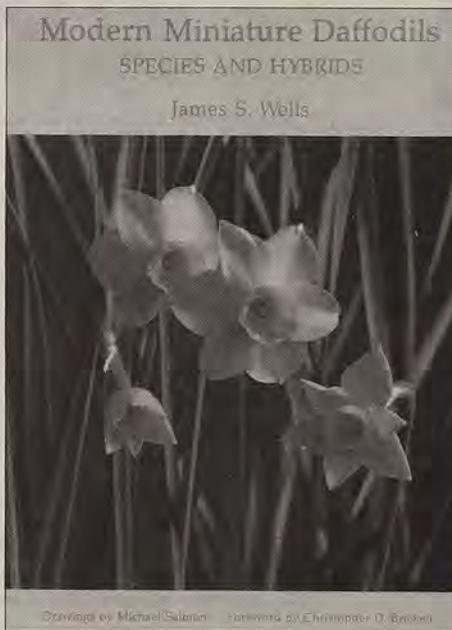
Rodale's Landscape Problem Solver: A Plant-by-Plant Guide

Most readers skip over the acknowledgment, preface, and table of contents, but in this particular book one of the most important messages is found in the introduction: healthy plants are the least susceptible to diseases and pests. Give them the proper amount of light, temperature, food, and water and they will be able to fend off most problems. If a problem does occur, the authors advise, use biological controls and environmentally-safe tactics such as Bt, rotenone, pyrethrum, and pheromone traps. In short, throw away those chemicals and read this book!

Part one lists cultural requirements, typical problems or pests, and controls and solutions for trees, shrubs, roses, ground covers, vines, foliage plants, and lawns. Part two lists various pests, insects, diseases, and nutritional problems; the third part addresses landscape management. A comprehensive source list for equipment and suppliers is by itself worth the cost of the book. But readers beware: this book focuses on plants typically grown in Eastern United States suburbs. By Jeff and Liz Ball. Rodale Press, Emmaus, Pennsylvania, 1989. 439 pages. Black and white drawings and photographs. Publisher's price: hardcover, \$24.95. AHS member price: \$19.95.

Modern Miniature Daffodils: Species and Hybrids

Daffodil, rock garden, greenhouse, and miniature plant enthusiasts will be delighted to learn of what is bound to become a new standard text on miniature daffodils. Not since Alec Gray's landmark book in the 1950s has anyone so thoroughly explored the world of lilliputian daffodils. Wells covers nomenclature, cultivation, propagation, hybridization, pests and diseases, and all the new species and hybrids as well as the classics. Excellent color photographs help identify them and will entice even the most space-limited gardener to grow at least a panful for their delicate blossoms. Although Wells lives in America, he addresses both British and American concerns for providing optimum growing conditions. Particularly valuable is an appendix of species and cultivars with symbols indicating whether they are best

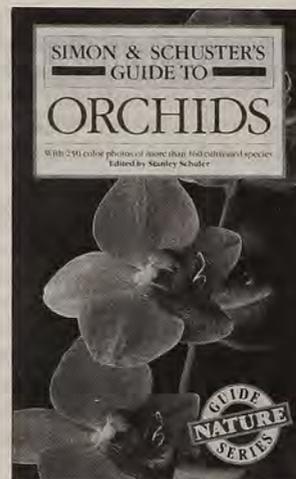


used for pan culture, outdoors, or both. By James S. Wells. Timber Press, Portland, Oregon. 1989. 170 pages. Color photographs and drawings. Publisher's price: hardcover, \$34.95. AHS member price: \$29.75.

—Peggy Lytton

Simon and Schuster's Guide to Orchids

From *Acacallis cyanea* to *Zygopetalum maxillare* this orchid guide provides an



alphabetical list of 162 cultivated species. Each entry features a brilliant full-color photograph along with easy-to-understand symbols for cultivation, temperature (cool house, intermediate/temperate house, hothouse), amount of light required (full sun, half shade, shade), and scent (absent or present). Also included are the plant's origin, description, and cultivation information. The guide contains a wealth of advice on growing orchids—the introduction includes detailed charts, drawings, and descriptions of the structure, classification and nomenclature, greenhouse and indoor cultivation, pests and diseases, and hybridization and multiplication. Symbols along the left side of the page quickly identify the best orchids for one's available growing conditions. A glossary, bibliography, and index are provided for the orchid enthusiast. Part of Simon and Schuster's *Nature Guide Series*, the book was originally published in Italy under the title *Tutto Orchidee*. By Alberto Fanfani and Walter Rossi. U.S. Editor, Stanley Schuler. Simon and Schuster, New York, New York, 1988. 255 pages. Color photographs, black and white drawings. Publisher's price: softcover, \$13.95. AHS member price: \$11.85.

Astrological Gardening

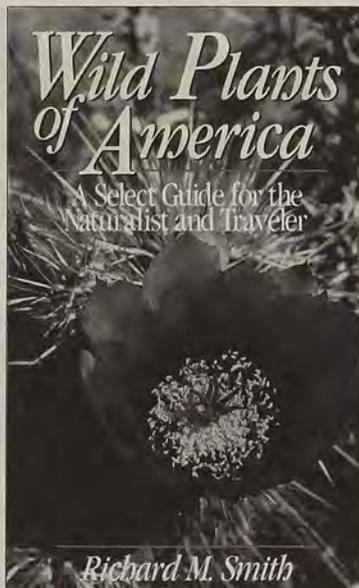
Louise Riotte has been practicing astro-organic gardening and herbalism for most of her nearly 80 years. Intended to supplement our current gardening practices, *Astrological Gardening* holds that the stars can influence the health of our plants. After defining the basic principles of

"Planting by the Moon's Phase" and "Planting by the Signs," Riotte explains when to plant and harvest vegetables, fruits, berries, edible flowers, herbs, sprouts, and nuts for the greatest taste and yield. For the doubting Thomases who would never be caught reading a horoscope, there is nonetheless useful information on organic gardening along with many plant and seed sources, recipes—one for apricot ice cream sounds especially delicious—and a comprehensive bibliography. Riotte's entertaining writing style is sure to capture the interest of even the most skeptical. By Louise Riotte. Storey Communications, Inc., Pownal, Vermont, 1989. 224 pages. Black and white drawings. Publisher's price: softcover, \$9.95. AHS member price: \$8.50.



Wild Plants of America

Nature walks were an important part of my childhood—I still remember the thrill of finding an "unknown" wildflower and searching through the guidebook to discover its name. Those who have had similar experiences will enjoy *Wild Plants of America*. Subtitled "A Select Guide for the Naturalist and Traveler," the book is not intended to be a field guide but rather a handbook of natural areas in the United States. Organized by geographic regions, it describes wildflowers, trees, shrubs, herbs, ferns, and plants to be found along trails, in natural areas, and in national and state parks. Smith has personally recorded most of the plants listed. The book will be helpful for vacationers and armchair plant explorers—I'm dreaming of trips to the White Mountains of New Hampshire in search of the Lapland rosebay and to The Ridges Sanctuary in Wisconsin for a glimpse of fringed polygala. General



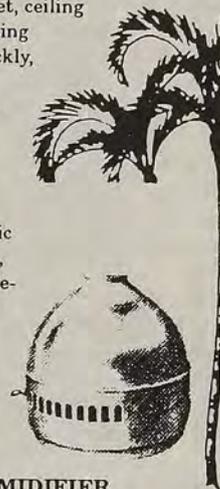
directions are provided to most areas. An appendix contains a supplemental list (including addresses) of botanical gardens and arboreta in 42 states and the District of Columbia, followed by a comprehensive index. By Richard M. Smith. John Wiley & Sons, New York, New York, 1989. 267 pages. Black and white drawings. Publishers price: softcover, \$12.95. AHS member price: \$11.00.

—Mary Beth Wiesner

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A list of all the books offered at a discount to AHS members is currently available. The list, which contains an order form, originally appeared in the September issue. To receive your copy send a self-addressed, stamped envelope to: Book List, AHS, 7931 East Boulevard Drive, Alexandria, VA 22308.

Gardener's Dateline

♦ Jan. 4. Lecture and Slide Show on Succulents for Winter Color.

San Marino, California. Information: The Huntington, (818) 405-2141.

♦ Jan. 6-Feb. 6. Victorian

Gardens Exhibit. Museum of Botany and the Arts, The Marie Selby Botanical Gardens, 811 South Palm Ave., Sarasota, Florida. Information: (813) 366-5730.

♦ Through Jan. 7. Annual Poinsettia Show.

U.S. Botanic Garden, Maryland Ave. and First St., S.W., Washington, DC. Information: (202) 225-7099.

♦ Jan. 8-Mar. 19. Extension Course on Lighting Design in Landscape Architecture.

Ernest Cowell. UCLA Campus, Room 2178, Bunche Hall, Los Angeles, California. Information: UCLA Extension, (213) 825-9414.

♦ Jan. 9. Landscape and Nursery Expo '90.

Sacramento Community Convention Center, Sacramento, California. Information: Ken Brizzi, (916) 455-2601.

♦ Jan. 12-14. Tenth Anniversary of The Ecological Farming Conference.

Asilomar, California. Information: Otis Wollan or William Enoch, (916) 346-2777.

♦ Jan. 19-20. Plant Professional's Symposium.

Sandhills Community College, Owens Auditorium. Information: SCC, 2200 Airport Road, Pinehurst, NC 28387, (919) 692-6185 or in NC (800) 338-3944.

♦ Feb. 1. Lecture on Selecting

Camellias. The Huntington, San Marino, California. Information: Catherine Babcock, (818) 405-2147.

♦ Feb. 1-2. Alaska Greenhouse & Nursery Conference including the Polar Grower Trade Show.

Soldotna, Alaska. Information: Cathy Wright, Alaska Division of Agriculture, SR Box 7440, Palmer, AK 99645, (907) 745-4119.

♦ Feb. 2-5. Knowledge for the '90s Management Clinic.

Sponsored by The National Landscape Association, Garden Centers of America, and the Wholesale Nursery Growers of America. Galt House East Hotel, Louisville, Kentucky. Information: The Management Clinic, 1250 I St., N.W., Suite 500, Washington, DC 20005, (202) 789-2900.

♦ Feb. 4-6. ASHS Southern Region Annual Meeting.

Little Rock, Arkansas. Information: Milo Burnham, Mississippi Cooperative Extension Service, P.O. Box 5446, Mississippi State, MS 39762, (601) 325-3935.

♦ Feb. 16-18. Maymont Flower and Garden Show.

Richmond Center, Richmond, Virginia. Information: Maymont, 1700 Hampton St., Richmond, VA 23220, (804) 358-7166.

♦ Feb. 16-19. Second Annual Northwest Flower and Garden Show.

Convention Center, Seattle, Washington. Information: (206) 789-5333.

♦ Feb. 24. Nineteenth Annual Long Island Tree Conference.

Sponsored by the Long Island Arboricultural Association. Roosevelt Hall, State University of New York at Farmingdale. Information: LIAA, Box 69, Holtsville, NY 11742, (516) 698-3366.

♦ Feb. 24-Mar. 4. 1990 Southern Spring Show.

Charlotte Merchandise Mart, 2500 E. Independence Blvd., Charlotte, NC 28205. Information: (704) 376-6594.

♦ Feb. 24-May 4. 1990 Longwood Graduate Program Seminar Series and Symposium.

Longwood Gardens, Kennett Square, Pennsylvania. Information: Longwood Graduate Program, 153 Townsend Hall, University of Delaware, Newark, DE 19717-1303, (302) 451-2517.

♦ Feb. 28-Mar. 4. Toronto's Garden Club 1990 Flower Show.

The Civic Garden Centre, 777 Lawrence Avenue East, Don Mills, Ontario. Information: The Garden Club of Toronto, 777 Lawrence Avenue East, Don Mills, Ontario, Canada M3C 1P2, (416) 447-5218.

♦ Mar. 1, 3-4. Wildflower Photography Lecture & Workshop taught by John D. Smithers.

The Desert Botanical Garden, Phoenix, Arizona. Information: (602) 941-1225.

♦ Mar. 9-19. Fourth FLORISSIMO Trade Show.

Parc des Expositions, Dijon, France. Information: Parc des Expositions de Dijon, Boîte Postale 108, 21003 Dijon, France, or call 80.71.44.34.

1990 Flower Shows

♦ Feb. 14-18. Atlanta Flower Show. Atlanta Apparel Mart, Atlanta, GA. (404) 876-5859.

♦ Feb. 16-18. Central Missouri Home Lawn and Garden Show. Expo Center, 1-70, Columbia, MO. (314) 372-2277.

♦ Mar. 2-11. New York Flower Show. Pier 92, 52nd St. and 12th Ave., New York, NY. (212) 757-0915.

♦ Mar. 7-11. Washington Flower and Garden Show. Washington Convention Center, New York Ave. and 9th St., N.W., Washington, DC. (703) 569-7141.

♦ Mar. 8-11. Metropolitan Louisville Home-Garden and Flower Show. Kentucky Fair and Exposition Center, Louisville, KY. (502) 637-9737.

♦ Mar. 10-18. Indiana Flower and Patio Show. Indiana State Fairgrounds, Indianapolis, IN. (317) 255-4151.

♦ Mar. 10-18. New England Flower Show. Bayside Exposition Center, Boston, MA. (617) 536-9280.

♦ Mar. 11-18. Philadelphia Flower Show. The Philadelphia Civic Center, 34th St. and Civic Center Blvd., Philadelphia, PA. (215) 625-8250.

♦ Mar. 24-Apr. 1. Cincinnati Home and Garden Show. Cincinnati Convention Center, Cincinnati, OH. (513) 825-1600.

♦ Mar. 24-Apr. 1. Portland Home and Garden Show. Multnomah County Exposition Center, Portland, OR. (503) 246-8291.

♦ Apr. 6-8. Ann Arbor Flower and Garden Show. University of Michigan, Yost Field House, Ann Arbor, MI. Information: Judith Corkran Katch, Matthaei Botanical Gardens, 1800 Dixboro Road, Ann Arbor, MI 48105, (313) 998-7343.

♦ Apr. 25-29. San Francisco Garden Landscape Show. Piers Two and Three, Fort Mason, Marina Blvd. and Buchanan St., San Francisco, CA. (415) 221-1310.

♦ May 22-25. Chelsea Flower Show. London, England. Information: Royal Horticultural Society, 80 Vincent Square, London SW1 2PE, or call 01-834-4333.

♦ Aug. 18-26. Southland Home and Garden Show. Anaheim Convention Center, Anaheim, CA. (714) 635-8330.

44th Williamsburg GARDEN SYMPOSIUM

April 1-4, 1990

The American Horticultural Society and the Colonial Williamsburg Foundation invite you to come to Williamsburg for the annual Garden Symposium, America's oldest and most prestigious gathering of garden enthusiasts.

This will be a fabulous opportunity to explore what's old and what's new in America's gardens. An array of renowned speakers will discuss the theme, "Vintage Plants and Contemporary Gardens." The Garden Symposium will entertain some of the newest ideas in American gardening, including the increasingly popular practice of using "old-fashioned" or "heritage" plants in today's gardens. Surprisingly, these antique flower and vegetable cultivars are found in gardens everywhere.

Through slide lectures, presentations, tours, exhibits, and clinics, practical ideas about updating gardens as well as innovative garden designs will be offered. In addition to the extensive group of speakers, there will be gardeners' clinics, special presentations, and an assortment of exhibitions and activities. "Garden Magic in the Magic City" is the theme for this year's featured city, Birmingham, Alabama.

Speakers in order of appearance are:

Rachel Snyder, garden writer and editor emeritus, *Flower and Garden* magazine: "Long Vistas from the Garden Path"

Elsa Bakalar, lecturer and garden designer: "Old Fashioned Flowers for Modern Gardens"

Frederick McGourty, author, nurseryman, and garden designer: "A Modern Old-Fashioned Garden"

John Alex Floyd Jr., *Southern Living* magazine: "Garden Magic in the Magic City—Birmingham"

Rosalind Creasy, author, lecturer, and designer of culinary gardens: "Heritage Vegetables and New American Cuisine"

William T. Flemer III, author, nurseryman, and horticulturist: "A New Look at Old and New Trees"



Virginia Bissell, Lula Rose Blackwell, Beverley White Dunn: "Elegance in Flowers: Flower Arranging Birmingham Style"

Henry Marc Cathey, director, U.S. National Arboretum: "The New USDA Plant Hardiness Map of North America"

John C. Austin, senior curator and curator of ceramics and glass, Colonial Williamsburg: "Did They Really Use These as Flowerpots? Eighteenth-Century Flower Containers"

Bonnie Lee Appleton, horticulturist, Cooperative Extension Service: "Making Old Gardens New"

David M. Lilly, retired chairman of the board, the Toro Company: "Welcome Spaces: User Friendly Gardens for Public Spaces"

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AHS Bulletin Board

Interns Beautify Grounds, Gain Skills

In 1989, AHS's River Farm headquarters was fortunate to have three outstanding interns and two part-time student groundworkers who helped the year-round staff make substantial improvements in the gardens and grounds. The interns gained practical knowledge about garden design, development, and maintenance.

The summer interns were Deborah Airhart, a student at the North Carolina State Agricultural Institute in Raleigh; and Mark Llewellyn, a graduate of Birmingham South who hopes to pursue an advanced degree in landscape architecture.

Helping part-time were Jane Beggs, a student in horticulture at Michigan State University, who has already reserved her place as an intern for the summer of 1990; and Elizabeth Zaitzeff, a senior in high school who also worked in the River Farm gardens part-time in the summer of 1988.

Those here in the summer not only received hands-on horticultural training, but took educational field trips to such places at the Washington Cathedral, the National Arboretum, the Gardens of the British Embassy, and the White House gardens and grounds.

Joining us this fall was Catherine Gau, a student at Murray State University in Kentucky. In addition to her work on the grounds, Gau has helped out with the AHS Book Program, and helped organize the annual Seed Program, which was just getting into full swing when she arrived.

"Classroom knowledge is an essential part of any education," says Gau, "but there is a major difference between



Catherine Gau

hearing how something is done and actually getting out there and doing it.

"Before I came here, I did not quite have a feel for outdoors maintenance. Now I am comfortable with almost any task. After I finish my education, I can apply for employment with confidence—something I would not have been able to do without my hands-on experience at River Farm. It has enriched my life and reaffirmed my decision to become a true horticulturist."

Donna Matthews, AHS horticulturist, noted that the intern program is an important aspect of the Society's educational mission. In 1990, she hopes to expand the program to four full-time interns, to give them more opportunities for field trips, and to provide more formal on-site classes.

Helping GROW Grow

AHS has recently teamed up with Garden Resources of Washington (GROW), a non-profit organization that, since 1982, has started and supported ten community gardens in Washington, D.C.

GROW provides a variety of services, including helping city residents find garden plots or start new gardens; assessing vacant land to determine its suitability for gardening; and helping city residents form committees to manage their gardens. When needed, GROW also provides technical assistance, such as soil tests and soil improvements, garden design, plowing, fencing, and gardening workshops.

AHS's involvement with GROW will include donating seeds to help the organization expand its efforts, and providing technical support through our educational outreach program. GROW hopes to both expand its existing community gardens and to develop several new gardens, including a new senior citizens' garden, more gardens for residents of public housing, and a garden at a shelter for homeless families.

Horticulture Guide Update Underway

AHS is updating and expanding *North American Horticulture: A Reference Guide*, last published in 1982. The new directory is scheduled to be published by Macmillan in late 1990.

We urge readers to send us the names and addresses of any organizations, institutions, or public gardens that they think we might overlook. These can include local, state, and regional horticultural organizations, including plant societies, trade associations, professional associations, conservation organizations, educational programs, plant collections, horticulture libraries and museums, and major flower shows. Another section will encompass historical horticultural displays, zoological parks with plant collections, and natural history museums with horticultural and botanical exhibits.

Compiling the information for the directory is Tom Barrett, who joined the AHS staff to serve as assistant editor of the guide. Barrett holds a bachelor's degree from the University of Virginia and a master's degree from Georgetown University. He has an avid interest in the environment and serves on the boards of several local recycling groups.

Send any information you would like to see included in the new guide to Tom Barrett, AHS, 7931 E. Boulevard Drive, Alexandria, VA 22308.

Advice for Winter

Viewers of the St. Louis television station KSDK in mid-November were able to receive free advice on caring for their plants this winter, courtesy of the station and AHS.

A flyer on winter plant care, developed for the NBC-affiliate by the AHS Gardener's Information Service, was available to viewers who requested it during a week-long winter station project aimed at helping residents prepare for cold weather.

AHS members can obtain the flyer by sending a stamped, self-addressed envelope to Winter Care, AHS Gardener's Information Service, 7931 E. Boulevard Drive, Alexandria, VA 22308.

Thank you to our 1988-89 Annual Fund Donors!

*These generous supporters have helped AHS
continue its worthwhile work in horticulture in 1989.*
We're grateful to each and every one of you!*



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*Leonard Haertter Travel Company, 7922 Bonhomme Ave. St. Louis, MO 63105, (800) 942-6666

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Rare Phacelia Saved from Extinction

The Nature Conservancy has launched a campaign to purchase the last remaining stronghold of the clay phacelia (*Phacelia argillacea*), a delicate wildflower hovering on the brink of extinction. For over 75 years the clay phacelia was thought to be extinct, but in 1971 it was rediscovered on a rocky slope in Spanish Fork Canyon, Utah. In 1988 it was discovered that the purplish blue wildflowers were pollinated by an equally rare species of bee—*Hylaeus granulatus*. Today the clay phacelia—or scorpion plant—is federally listed as endangered.

The plant's slope is heavily used by deer and sheep and populations have declined by 90 percent over the past nine years. In May 1989 only 20 plants remained. Dave Livermore, head of The Nature Conservancy's Utah efforts observed, "In the last few years, wild native plants have contributed greatly to cancer research and other medical developments. The loss of the clay phacelia and other plant species around the globe represents future losses of medical and other benefits to the generations that follow."

For more information write: The Nature Conservancy, 1815 North Lynn Street, Arlington, VA 22209 or The Nature Conservancy, Great Basin Field Office, P.O. Box 11486, Pioneer Station, Salt Lake City, UT 84147-0486.



Clay phacelia (*Phacelia argillacea*)

Ann Rilling

No-Salt Insurance

Many of the products used during the winter to keep neighbors from tripping on sidewalks and vehicles from skidding on roadways contain salt that can kill plants ranging from lawns to trees. Plant lovers will use alternative substances, such as urea, to melt ice and snow, but local governments and neighbors may not always be so conscientious.

The fall issue of *Bartlett Tree Topics*, published by the F. A. Bartlett Tree Expert Company, suggests that if you can't keep the salty water away from plants by diverting runoff or constructing barriers, you may be able to offset damage with gypsum.

Salt injury can resemble damage caused by drought or pollution, including delay in leaf budbreak and flowering; stunted foliage and buds; reduced shoot growth; tip or margin foliage browning; crown thinning and tufting of foliage at the tips of branches; premature fall coloration and defoliation; and dead twigs.

When salt is present in the soil, water will be drawn to the salt and become unavailable to plant roots. In high concentrations, the salt will even siphon water out of the roots so that the plant becomes desiccated. Salt can also damage the soil's structure and raise its pH.

Gypsum helps in two ways. The negatively charged sulfate ions in gypsum bond with the positive sodium ions to form sodium sulfate, a highly soluble salt that is quickly leached from the soil. The positive calcium ions left from the gypsum then bond with negative clay molecules making the soil more permeable.

Gypsum is probably best known to gardeners for this effect of helping to aerate compacted soil. The Bartlett company says applying 200 to 400 pounds per 1,000-square feet of soil will both neutralize salt and break up compacted soil. It is not environmentally harmful when used in such amounts.



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